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Light and Lighting

April 1960

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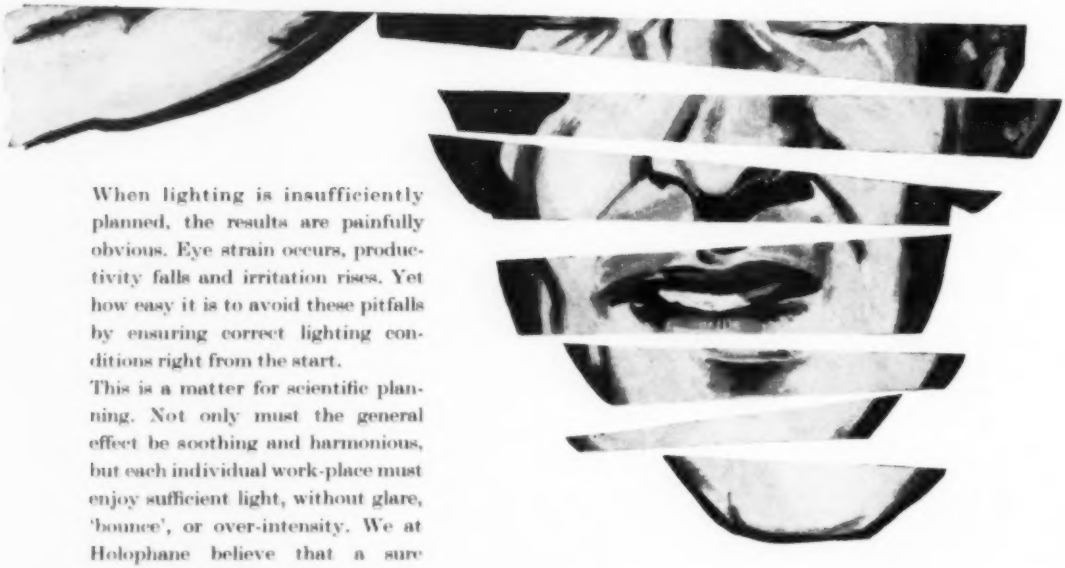

When lighting is insufficiently planned, the results are painfully obvious. Eye strain occurs, productivity falls and irritation rises. Yet how easy it is to avoid these pitfalls by ensuring correct lighting conditions right from the start.

This is a matter for scientific planning. Not only must the general effect be soothing and harmonious, but each individual work-place must enjoy sufficient light, without glare, 'bounce', or over-intensity. We at Holophane believe that a sure remedy for these ills is . . . *scientific control*—an aspect of lighting which has occupied our engineers and research staff for upwards of sixty years.

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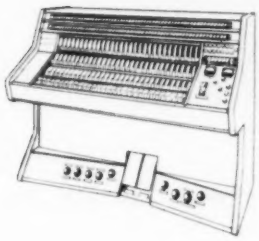
Backstage at the Falkoner-centret Copenhagen showing part of the extensive stage lighting installation. Remote control is provided by a Strand 120 way Stage Lighting Console, having 2 dimmer presets and 14 memory presets.



This admirable booklet will enable those whose work it is to design a stage, to produce one that is functional and also a delight to producers, technicians, cast, and the audiences who go in the hope of enjoying the show. This publication, which is most comprehensive, deals with planning details, draperies, equipment, lighting and special problems that have arisen from existing stages. It is a guide for initial planning, showing how to avoid restrictions that may make future extensions economically and structurally impossible. 'Stage Planning' is free and post free.

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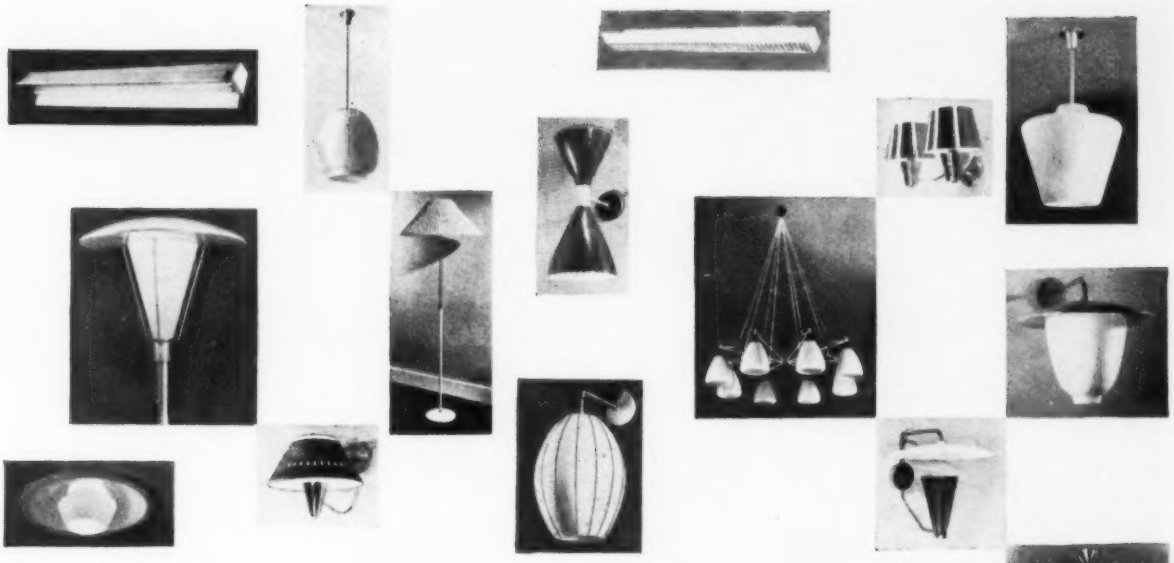

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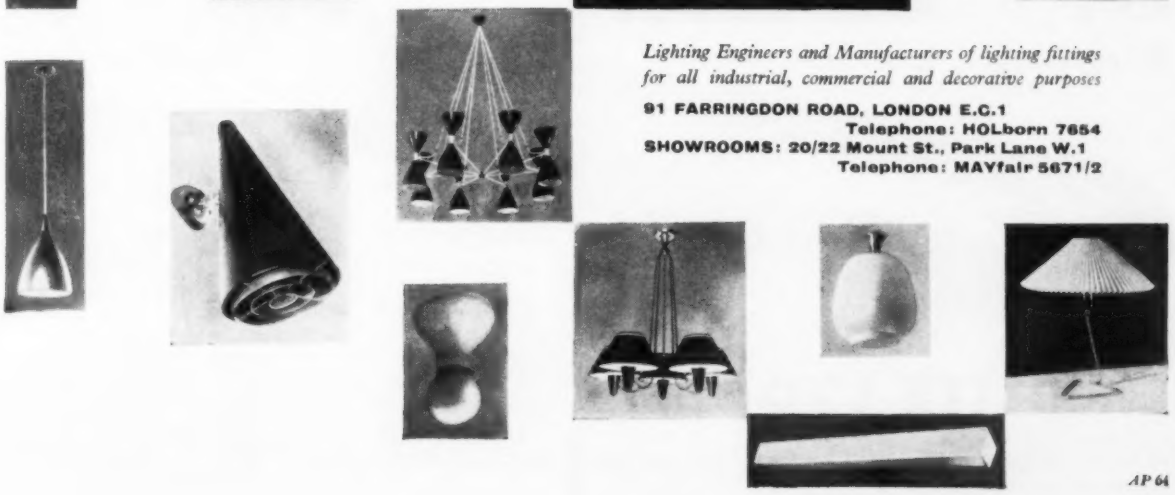

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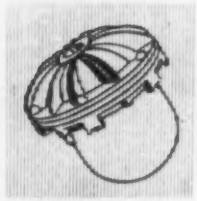
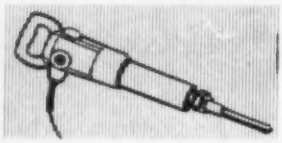
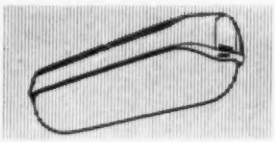

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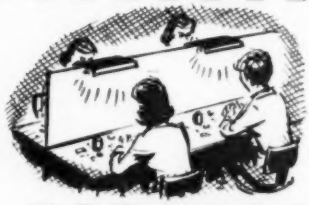
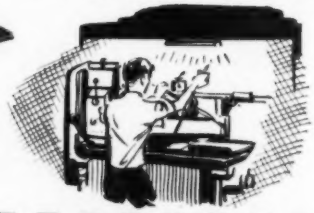


MACHINE LIGHTING



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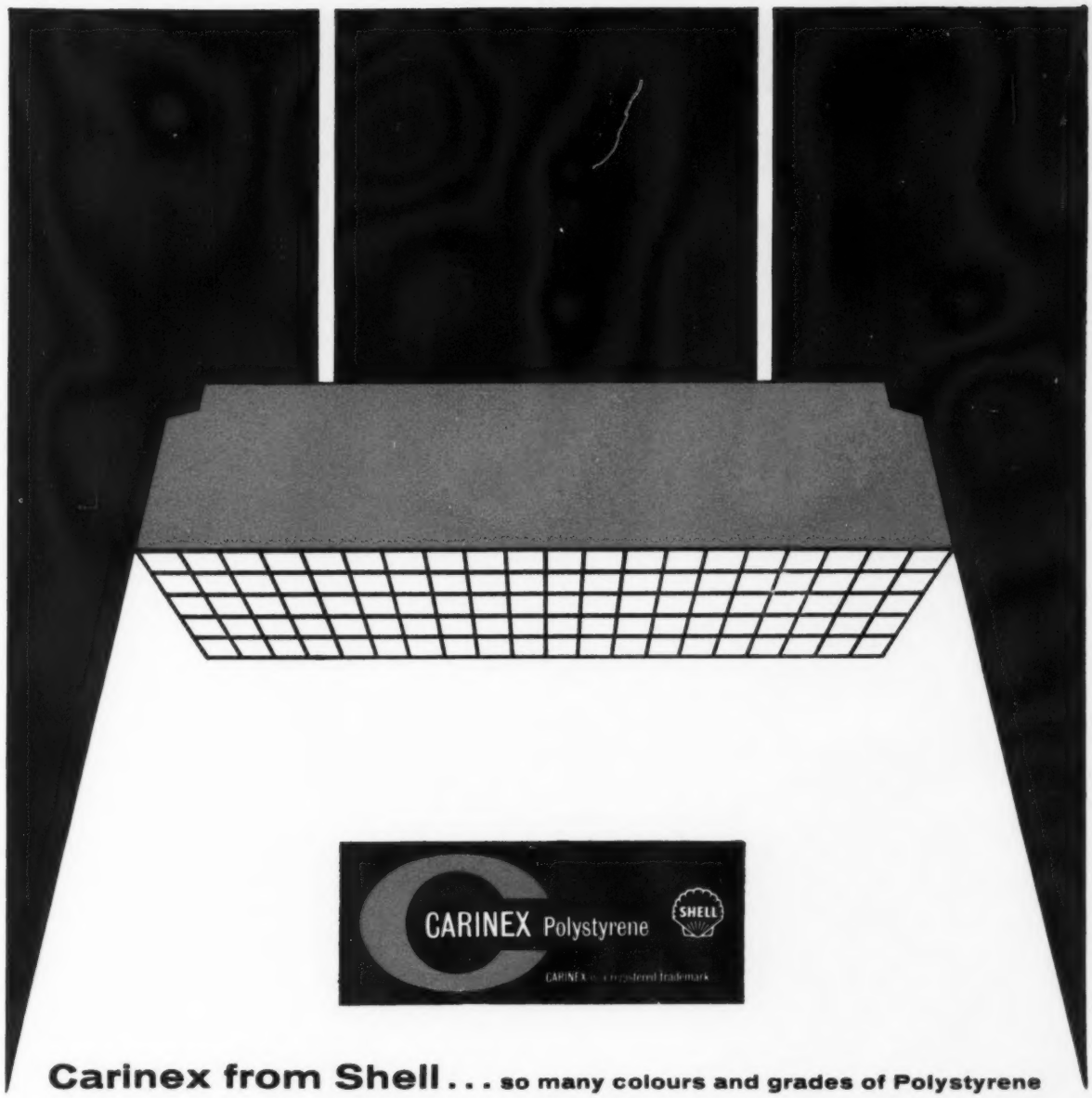

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SHELL

P8-7

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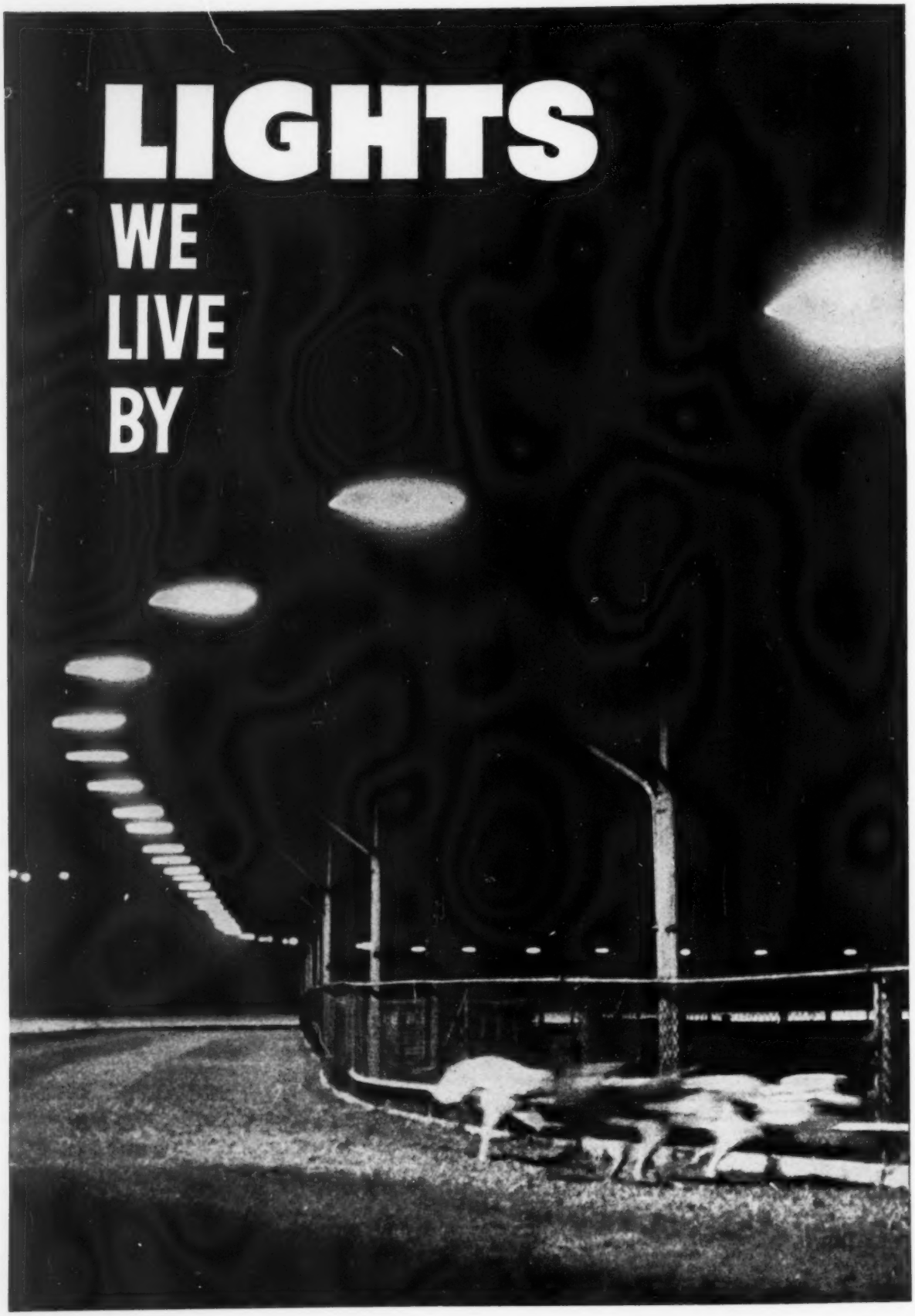
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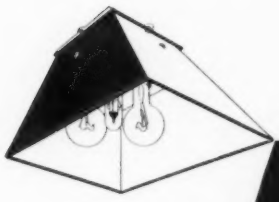

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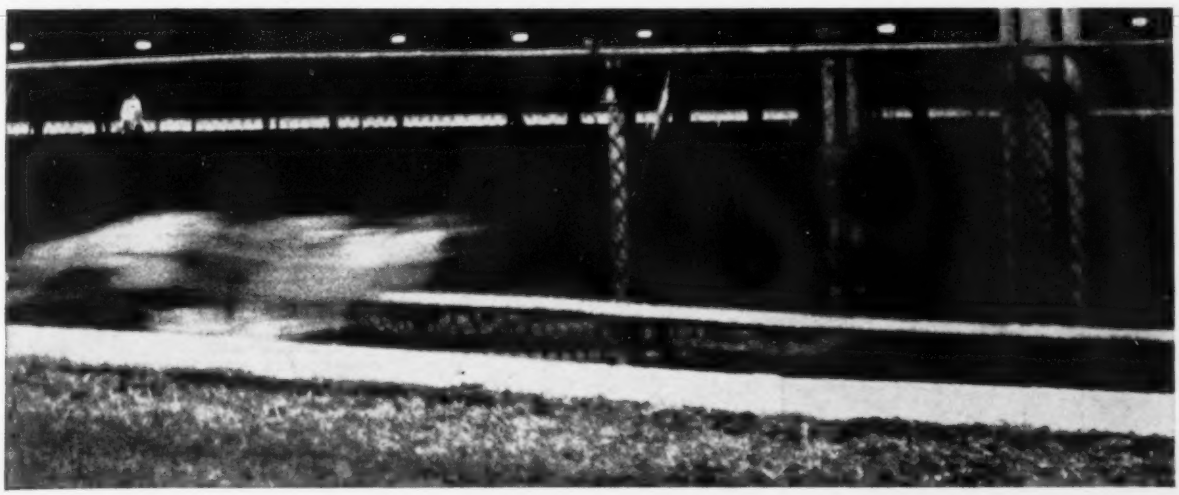
DOG TRACK FLOODLIGHTING FITTING *Vitreous enamel body, grey outside and white inside; accommodation for one 400 watt Mercury Vapour lamp, two 500 watt Tungsten lamps; arranged for top or side entry bracket suspension, also for catenary suspension. Approx. dimensions 2' 0" x 1' 6" x 1' 6", fittings were designed by the Chief Engineer, Greyhound Racing Assn. Ltd., and are now being installed in all G.R.A. stadia.*



Hunts capacitors for discharge lighting applications

New ranges of capacitors (Types L89/4 and L89/5) employing specially processed impregnants are now available. They are based on Hunts popular designs for fluorescent lighting applications. Full details freely available on request.

TYPE L89/5 STANDARD RANGE *(8 μF to 20 μF at 250 v A.C. wkg.)* *Temperature Range:* −40°C to +70°C. ideal for Street Lighting applications in all climatic conditions.

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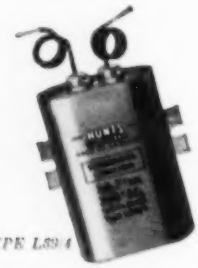
TYPE L89/5



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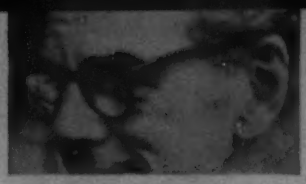

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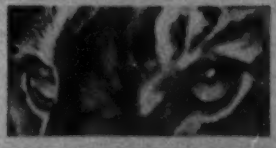

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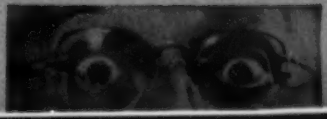

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TYPE L89/5

TYPE L89/4

* Streamlined design
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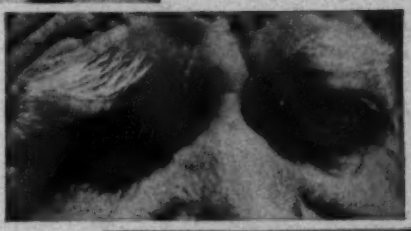

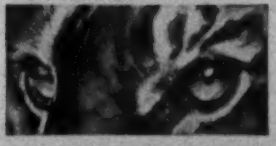

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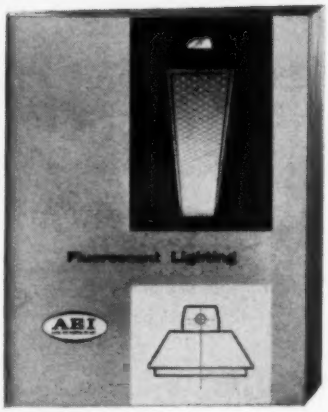

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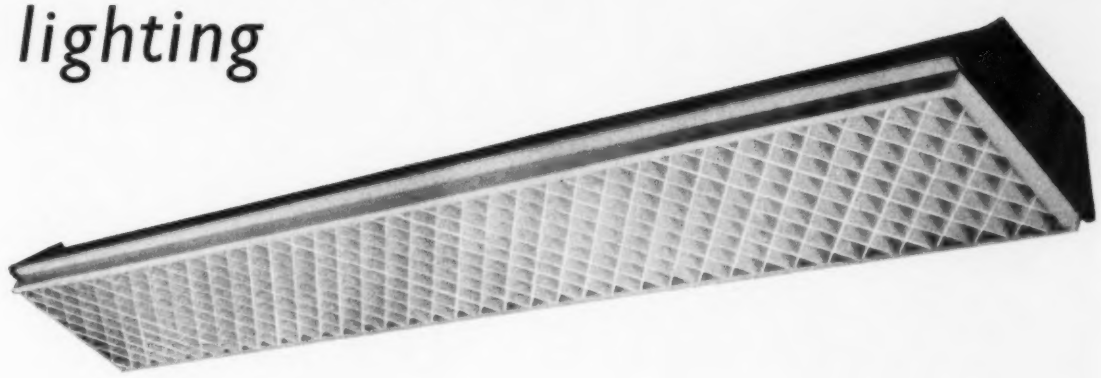

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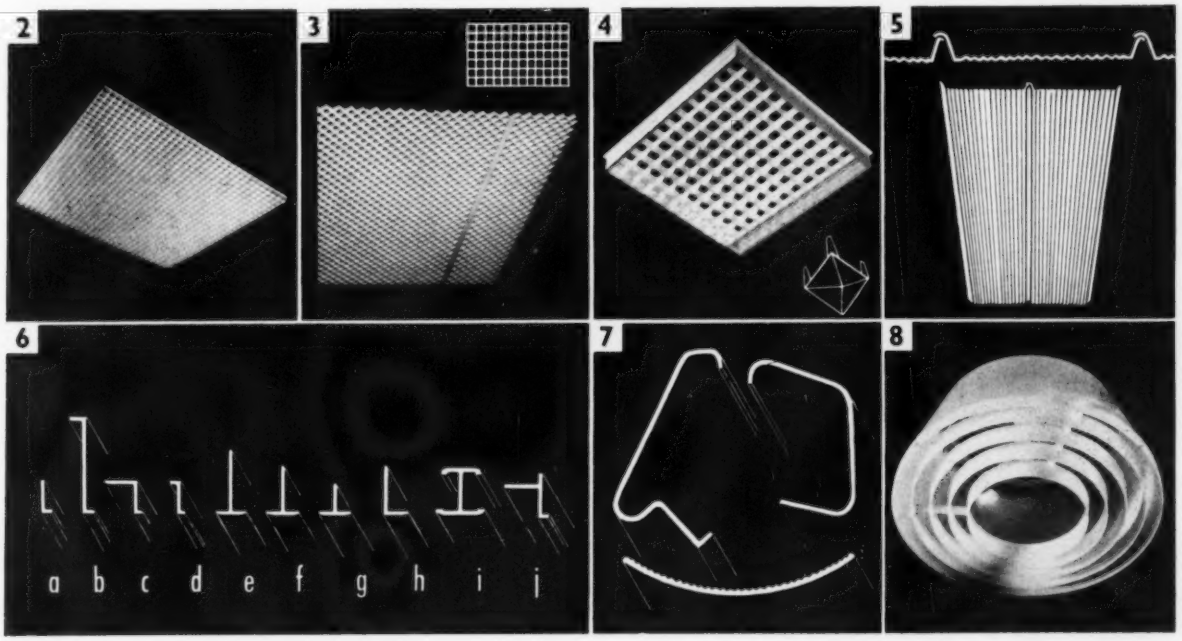
7 Typical sections of plastic extruded diffusers, as supplied to lighting fitting manufacturers.

8 Moulded plastic shade and louvre as produced to the design of Messrs Hume Atkins & Co. Ltd. (Registered Design No. 880153).



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The superb, bold simplicity of modern Scandinavian glass can be seen in this range of new Atlas fittings based on an original design by TAPIO WIRKKALA. It achieves a remarkable combination of colour effect, elegance and functional efficiency.

The fittings are of double-sleeve design, the inner luminous white opal glass creating a solid tube of light giving direct downward illumination and casting a warm glow from the coloured glass outer.

With a choice of four colours and two shapes of outer sleeve, plus four shapes of inner, the Atlas 'Finlandia' range offers great scope for decorative lighting singly or in clusters.

Literature containing further details is available on request.

ATLAS LIGHTING LIMITED
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DTV

See the Atlas stand at the A.S.E.E.

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the automatic choice for lighting control

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The large range of Time Switches which Horstmann make are used for many different applications, notably for the control of street lighting, special tariff schedules, shop window lighting, and electric signs—in short wherever electric current needs to be controlled automatically.

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The silver-cadmium oxide contacts will make, carry and break loads of their full rated capacity for long periods without deterioration.

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Horstmann Time Switches for controlling things Electrical

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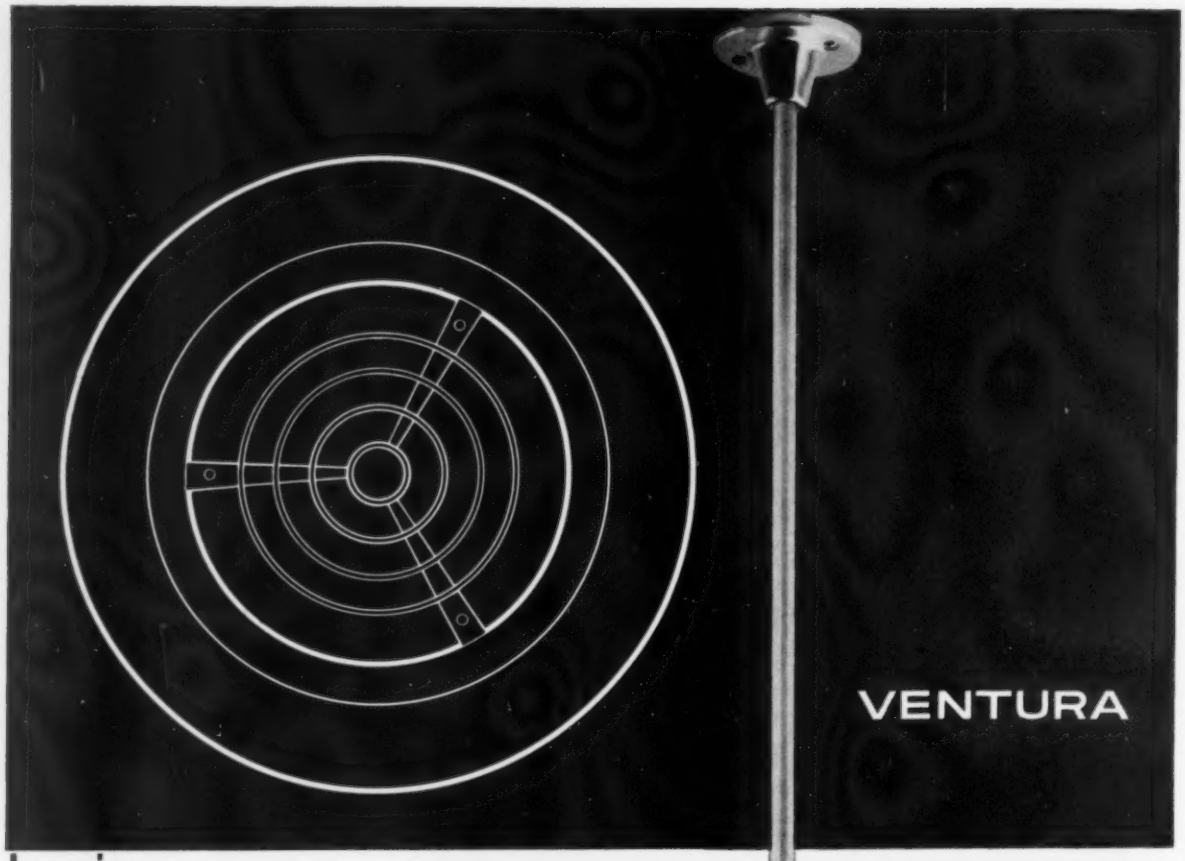

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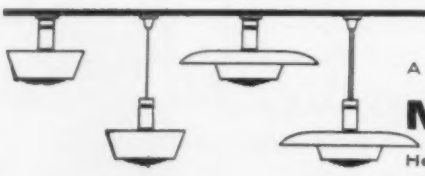

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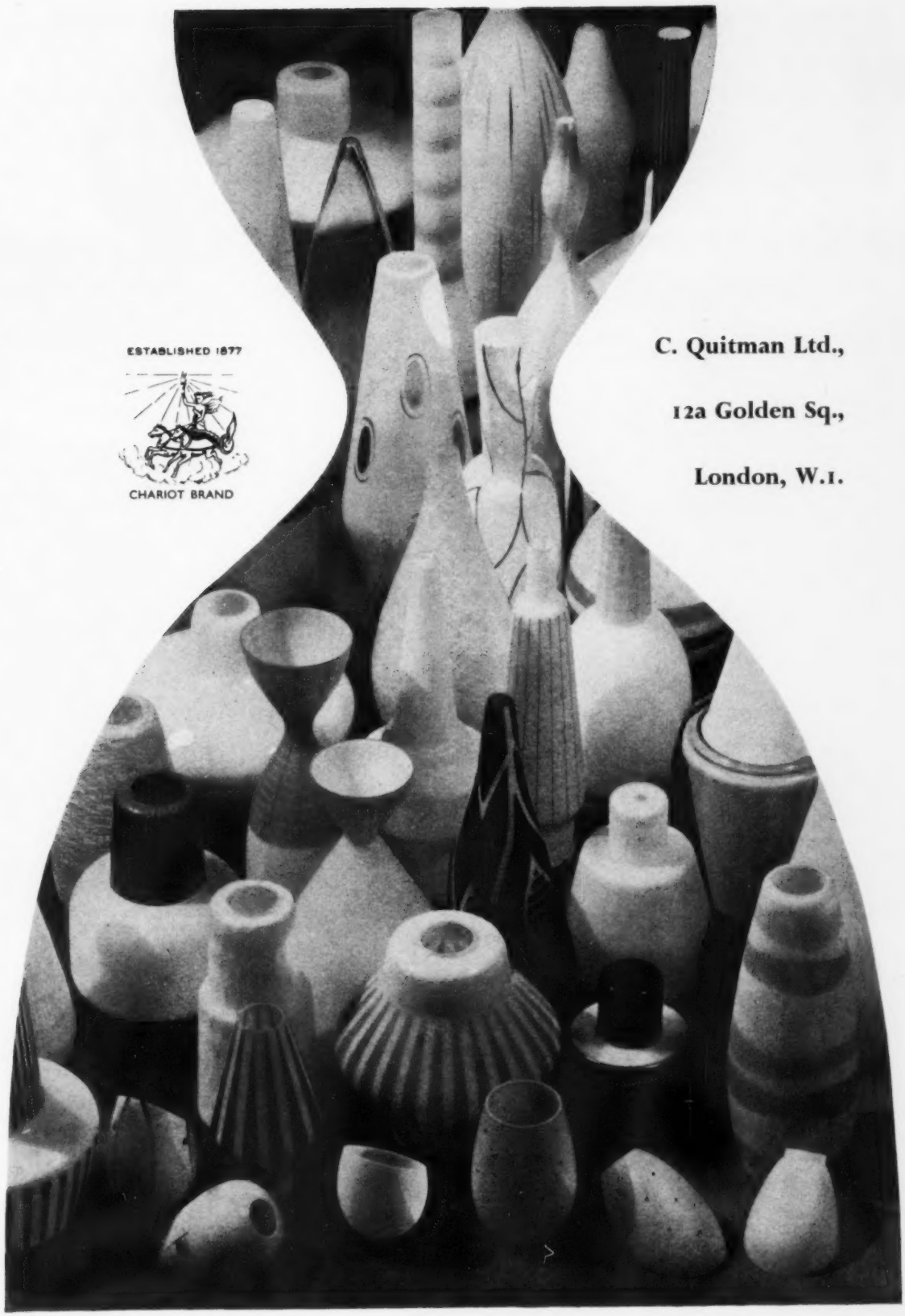
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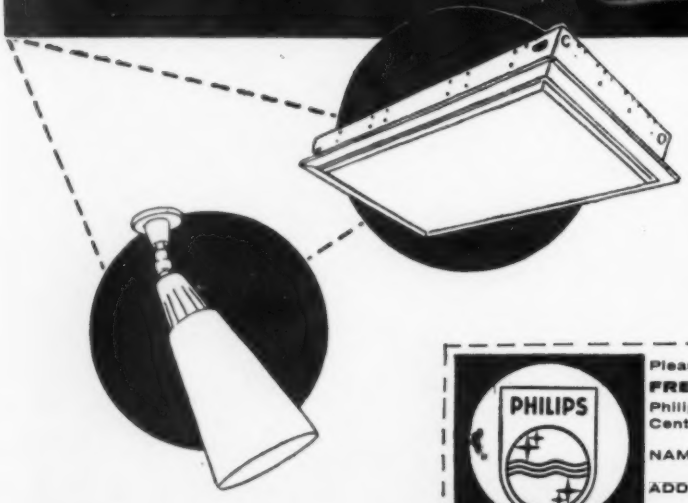

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Light and Lighting

Vol. 53 No. 4

CONTENTS

International Review of 1959: Report on developments in light sources and lighting equipment and on lighting installations in other countries based on information supplied by correspondents in:

Australia
Belgium
Canada
Denmark
Finland
France
Germany
Greece
Holland
Italy
Japan
New Zealand
Norway
Spain
Switzerland
United States of America
Yugoslavia

The text (**pages 85-89**) is followed by 24 pages of illustrations showing luminaires, installations in streets, schools, churches, shops, factories, offices, hospitals and places of entertainment, floodlighting, lighting for sports and other exteriors.

Miscellany: IES Meetings—IES Summer Meeting—Situations (**page 115**)

Postscript: By 'Lumeritas' (**page 116**)

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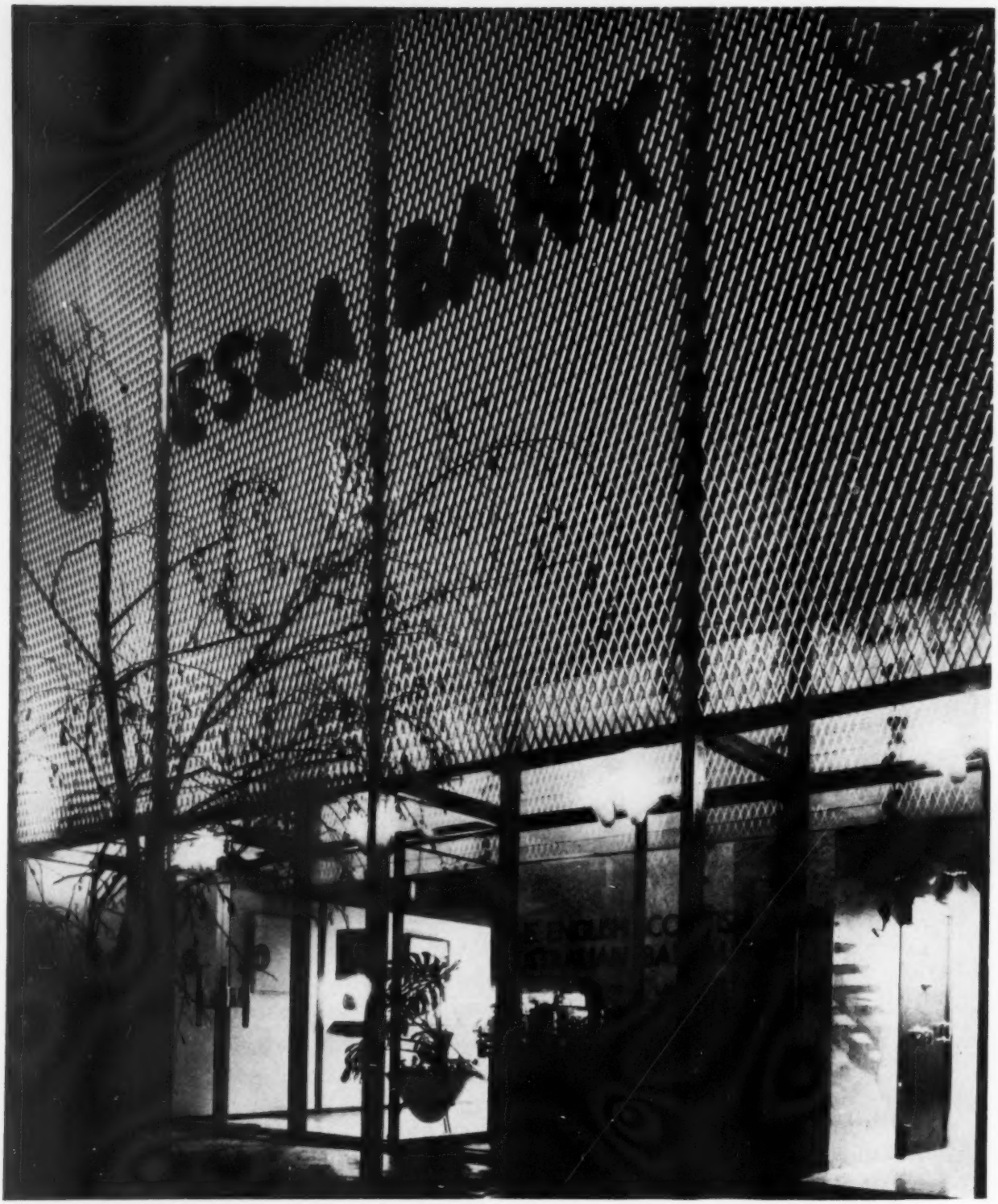
World Lighting

THE fields in which lighting is applied are much the same the world over but practice has many variants and these are to be found in every country. But there are also differences of practice as between one country and another, and these are possible without departure from fundamental principles. It is usually interesting and instructive to keep abreast of the state of the lighting art in different lands and so, once a year, we make a special feature of reviewing lighting developments abroad; although our pages are open all the year round for dealing with overseas current affairs of lighting which seem to be of special interest. Topics which continue to engage attention in various countries—and not least in our own—are glare and levels of illumination. It may well be thought that these aspects of lighting have been discussed and worked on ad nauseam in our time, and that if we do not yet know enough about them we ought to. However, there are numerous other aspects of lighting which are live topics internationally, and for the further study of which Committees of Experts have been set up by the Commission Internationale de l'Eclairage. In this issue we are concerned chiefly with what has been accomplished not by committees but by lighting engineers and artists. There is always something new in the way of lighting installations and equipment and it does not have to be dramatic to be interesting. Versatility in designing lighting is something that should be cultivated and this involves assimilating diverse ideas of how lighting may be done in any field of application.



The façade of the Clayton branch of the English, Scottish and Australian Bank in Melbourne, Australia. The white-enamelled grille is lit from below and behind by four pairs of 150-watt reflector lamps. (Electricity Trust of Australia.)

International Review of 1959

WE START THIS YEAR'S REVIEW where we left off last year—on the subject of illumination levels. Interesting though many of the technical achievements of the year may be, this is the one subject that is common to nearly all the contributions we have received from our far-flung correspondents. A general upward trend in illumination levels during the last few years was more or less inevitable with the continued improvement in lamp efficiencies. There are indications, however, that during the past twelve months a number of countries have taken decisive steps forward, certainly as far as practice is concerned even if recommended values in codes lag behind. In Yugoslavia 25 lm/ft² for general offices and 50 lm/ft² for drawing offices are being used and similar levels are reported from New Zealand and elsewhere, whilst so many correspondents now quote levels of 50, 100 and 200 lm/ft² for shops and shop windows that one might almost believe an international code exists in practice if not on paper.

A good way of improving factory lighting has been found in Denmark. A committee appointed a couple of years ago to revise the lighting code included a representative of the factory inspectorate who, becoming alarmed at the number of accidents in factories attributable to poor lighting, had all the factory inspectors supplied with photometers. Now if the lighting of any factory is below the recommended level he orders relighting within two months; if this is not done the factory is closed. Says our correspondent: 'It works quite well.'

Evidence is also beginning to emerge in certain countries that better lighting in industry and commerce is creating a demand for better lighting in other places such as schools and homes. And by better lighting is meant not only higher illuminations but better designed installations. The school building programme in Yugoslavia has certainly been affected in this way and in New Zealand the state controlled schools have at last dispensed with bare fluorescent tubes in favour of something more aesthetically satisfying. The fact that the latter change was brought about mainly because the schools are widely used for adult evening classes only emphasizes the chain reaction.

Better design of both fittings and installations was essential with rising levels of illumination. Though in previous Reviews we have tended to emphasize designs of tungsten lamp fittings at the expense of those for fluorescent lamps, during the last few years a silent revolution has been taking place on the latter. Materials, methods of light control, mounting and maintenance have all changed. Collections of fittings hanging from a ceiling now look somewhat odd—though a few years ago this was the best the lighting engineer could do. And once again, as the public becomes accustomed to good design in the places where it works or shops, it will expect similar standards elsewhere. There is a story from one country concerning an internationally known architect who was responsible for a very large block of new offices. He was determined not to give way to this fad for fluorescent lighting and installed tungsten lighting throughout. Now the workers complain about the poor lighting—and of the heat.

One of the problems which has worried the lighting engineer for many years, and which threatened to be even more troublesome with higher illuminations, is glare. Back-room boys in the laboratories have given a lot of attention to this and have pro-

This Review is based on information supplied by

Stuart Lay (Australia)
Andre Boereboom (Belgium)
R. W. Sclater (Canada)
Bent Knudsen (Denmark)
Esko Paivarinne (Finland)
J. C. Kuenemann (France)
E. Wittig (Germany)
V. Benzio (Italy)
S. Ishizaka (Japan)
J. Kissel (New Zealand)
Rolf Aspestrand (Norway)
Juan Lillo (Spain)
T. D. Wakefield (USA)
B. Obermann (Yugoslavia)
and Gaston Antebi and
A. W. Gostt who supplied information on a number of countries.

duced a number of very useful materials and techniques. Perhaps the most outstanding contribution however was that of a few practical minded people in Australia who two or three years ago carried out some tests so that they could give some guidance in the new Australian lighting code on the avoidance of glare. Though this was not a 1959 development it was during that year that we began to appreciate the importance of the Australian work. (The work is reported in a paper by J. C. Lowson entitled 'Practical application of direct discomfort glare research in the new Australian lighting code', in *Trans. Illum. Eng. Soc.* (London), **24**, No. 4 (1959).)

LIGHT SOURCES

The lighting engineer is always interested in new light sources and improvements to existing ones. Like many other technicians he is always saying 'if only we had . . .'; but when he gets his heart's desire it is often a matter of years before he decides how to use it. The very-high-output fluorescent lamp has now been with us for three years but there seems to be no great urge to use it; the 200-watt high efficiency sodium was introduced only last year but its proper place in the tool-kit has yet to be found. The General Electric of America during the year introduced an improved version of their power-groove lamp which has grooves on both sides instead of only one; the 215-watt 8-ft lamp gives 70 lm/w, an increase of 15 per cent. However, though new lamps get most attention there are steady improvements on existing lamps. With fluorescent lamps ballasts get smaller, colour rendering gets better, lamp life gets longer and the range of sizes gets bigger. Such improvements are common in nearly all countries where fluorescent lamps are made. Similar improvements are announced in colour-corrected mercury lamps which in some countries appear to be replacing fluorescent tubes in some applications, notably in street lighting. One of the smallest lamps introduced during the year (by the GE of America) is a 4-watt ozone-producing lamp. This is a low pressure mercury lamp primarily intended for use in the home to combat unpleasant odours in kitchens, bathrooms, etc.; one lamp for each ½ cu. ft. of storage space is said to keep at bay smells from mildew and dampness. The development of xenon lamps still seems to be confined to Germany where the Osram Company has added 6 kW and 10 kW versions (23 and 22 lm/w respectively) to its range of long-arc high-output lamps, and 500-watt, 1 and 2 kW projector types to its short-arc high pressure xenon lamps. The only news on electroluminescence also comes from Osram in Munich who have a number of plates suitable for scales, measuring instruments, etc., operating on 2-3 lm/w. Other trends worth noting are the growing use of reflector type lamps (tungsten and colour-corrected mercury) for industrial lighting in dirty atmospheres, and the use of low voltage spot lamps for shop window and display lighting.

LUMINAIRES

In the section on luminaires only two for use with fluorescent lamps are shown, both from Japan. Both consist of a relatively simple wooden frame with plastic panels; one houses a circular fluorescent lamp and the other two 30-watt straight tubes. The remaining examples illustrated are for tungsten filament lamps and once again Denmark and Finland are to the fore. In Denmark members of the architectural profession have taken the lead in luminaire design for the domestic market; their use of nylon louvres has enabled them to produce fittings which are not only attractive to the customer but which also meet the critical requirements of the lighting engineer. Also from Denmark is one example where thick crystal glass is used in such a way that it becomes luminous. The Finnish fittings make effective use of clear and opal 'Perspex' and an interesting innovation is an adjustable spotlight made of opal glass. (We are sorry we are unable to include any designs from Australia this year but the leading designer of lighting fittings in that country was too busy at his drawing board to meet our date. We hope he will come in next year.)

Whilst on the subject of luminaires it is appropriate to mention the vast range and variety of design which was to be seen at the 1959 Hanover Fair; the range was such that a buyer must have had great difficulty in making his choice. We have almost reached the stage where there is a light source for every lighting problem and a range of luminaires to match. The latest designs of the German glass manufacturers were

prominent at Hanover and the growing interest in well-designed glassware for domestic lighting fittings was obvious. Many countries exhibited at the Fair and some of the exhibits are included in this review.

STREET LIGHTING

Street lighting engineers in most countries are busier than ever and new installations are going up as quickly as the manufacturers can provide the equipment. It would even seem that lighting authorities have begun to appreciate their responsibilities in this motor-car age and are now finding the money to provide better road lighting and thus save lives. The lantern designers, however, would appear to be taking a rest; perhaps they have become overwhelmed with the number of light sources now at their disposal and experience has taught them that every new light source presents its own problems in lantern design. The flow of new lanterns from Germany, however, is still prolific and the designers there seem to lose no time in getting to work with new lamps. The colour-corrected mercury lamp still attracts a lot of attention but it will be obvious, ingenious as many of the new lanterns are, that this lamp is not going to provide the answer to all the aesthetic criticisms that were made about tubular fluorescent lamp lanterns.

Included in the information we have received from various countries (enough to provide at least the basis for a book) are some interesting statistics from Belgium. The city of Antwerp recently celebrated the installation of its 50,000th discharge lamp; 71 per cent of the street lighting is by mercury lamps and the city now boasts one street lamp to every eighteen inhabitants. There has been a great drive for better street lighting in Belgium during the past twelve years and in 1958 public lighting accounted for 7·6 per cent of electricity consumed in the whole country, an increase of nearly three times the 1946 figure. Though local authorities in Belgium have become very public lighting conscious there is still an urge towards more and better installations and we gather that consideration is being given to the continuous and uniform lighting of 750 km. of main roads within the next five years. Cut-off lighting is still preferred and the trend is towards totally enclosed fittings to reduce maintenance. The Belgians are of course handling the CIE test length near Brussels to compare the British non-cut-off and the Continental cut-off systems. It is interesting to note that Philips and Schreder are co-operating on another 300-metre test length where it will be possible to make many adjustments to the height and light output of lanterns. The village of Zoutenaaie recently demanded and got a 100 per cent increase in its public lighting installation; its thirty-six inhabitants now enjoy four lamp-posts.

In spite of all the improvements achieved in Madrid by Juan Lillo, the city's lighting engineer, during the last eight years or so in which the main roads have been equipped with a very high standard of lighting, much apparently remains to be done and a grant of four hundred million pesetas (over £2¼ million) has been allocated for the purpose. It is not surprising that many manufacturers of international repute have opened factories for street lighting equipment in Spain. Many of the other large cities in Spain are now following the lead of Madrid in matters of street lighting. An occasion to show what the public lighting department of Madrid could do was provided by the recent visit of President Eisenhower. A good deal of special street lighting and flood-lighting was arranged and along the Avenida de la Castellana, which is about 1½ miles long, the whole existing installation was ripped out and a new one involving 236 40-ft. columns was erected in ten days; the average illumination on the roadway given by the new job was 5 lm/ft². The cost of the operation was nearly £100,000.

Three examples of bridge lighting are shown. The Pont de Tancarville near Le Havre is 1,600 metres long including the centre span of 600 metres which is 55 metres above the water. The carriageway is 14 metres wide and lit by 125-watt colour-corrected mercury lamps mounted at a height of 8 metres with a spacing of 23·5 metres. A very different type of bridge, shown on the front cover, is the foot-bridge over the dam of the hydro-electric power station at Rheinau in Switzerland. The interesting feature there is that fluorescent lamps are inserted in the half-open-section railing which has an inner 'Perspex' sleeve to protect the lamp. A continuous strip of lamps is provided along the 200-metre length of the bridge on one side only; the footpath is about 5 ft. wide and the illumination on the side away from the lamps is 0·5 lm/ft². In New Zealand sodium lamps have at last got a foothold in Auckland where they

have been used on the Harbour Bridge and approaches and will be used on the new motor-ways through the city. The arrival of the first 200-watt linear sodium lamps in that country is anxiously awaited.

In Italy parts of the motor-way which will run between Milan and Naples have been lit by very high mounted lanterns on twin-arm columns in the central reservation. From Denmark we learn that the replacement of some 8,000 gas lamps by post-top fluorescent lanterns is in progress, as also is the replacement of many old tungsten lamp lanterns by simple cut-off type fluorescent lanterns. A good deal of relighting has been going on in and around Paris and the lighting of the first section of the Autoroute du Sud which is now under construction is due to come into operation very shortly.

FLOODLIGHTING

Floodlighting as a tourist attraction has spread considerably since the French showed the way some years ago, though floodlighting for the sheer beauty of the thing and the pleasure of local inhabitants has its place as is shown by the picture of the little church at Lillehammer in Norway. Three of the pictures show the advantage of a sheet of water in the vicinity of the place floodlit. Both Spain and Belgium have long regarded floodlighting as complementary to street lighting—something which has often been suggested by town-planners but which few have put into effect. The outstanding *Son et Lumiere* production was that at the Acropolis in Athens with which was associated the lighting of many of the ancient monuments in that city. The whole of the technical arrangements for the *Son et Lumiere* spectacle were handled by the Philips organization; 1,100 floodlights were used and the total power for light and sound was 900 kW. We gather that there is a possibility of this form of entertainment spreading to Denmark during the present year.

OTHER EXTERIORS

An interesting development during the year is the lighting of gardens and examples are shown from Denmark, France, Germany and Italy. Most of us know how attractive gardens and parks can be at night; it is surprising that there are so few installations. Golfing readers may be interested to hear that in Montreal there are now a 180-tee golf driving range, two eighteen-hole miniature courses and an eighteen-hole par-three course, all of which are floodlit. The owner spent 2,500,000 dollars on these 'golf gardens'.

New lighting using the Calvert system has been installed at Copenhagen Airport to enable it to be used by modern aircraft. A special system has also been installed for the ground servicing of aircraft at night. On each stand area twenty-eight flush fittings each housing two 20-watt fluorescent tubes have been let into the ground in a pattern following the contour of an airliner. The mechanics who work with it speak very highly of the system. During the installation of these lights a pilot coming in to land decided that they provided the ideal solution to the landing mat problem. As a result further tests were carried out and a landing mat of similar recessed fittings, this time housing three 40-watt green tubes, has been installed. As the fittings are really flush with the ground it has been possible to clear snow (not infrequent in Denmark) from the runways by snow-plough. The landing mat is made up of 300 fittings, and 1,500 are used in the stand areas and taxiways.

FACTORIES AND OFFICES

New factories are springing up all over the world and as a rule they are lit to standards well above the average. There is also an inevitable move to improve lighting in existing factories. In new offices the emphasis still seems to be on putting on a good front for the benefit of the visiting public (and for those who are allowed into the executive suites) but little is known about the lighting of general offices where the bulk of the work is done away from the gaze of the public. Improvements in general office lighting are, however, reported in the USA and Canada; let's hope this trend will spread before long. In the USA where labour costs are high there is a tendency to go in for pre-assembled luminous ceilings which are put together in the factory where the work can be done in less time and at lower cost; ceilings such as the Wakefield Twenty which measures 6 ft by 8 ft can then be used either singly in small offices or in mass to cover a whole ceiling.

MEDICAL

Interesting in the medical field is some work which has been done recently in France on the visual task of the dentist and the lighting of dental surgeries. A dentist may work for long hours doing very critical work, some of which has to be done very quickly. Many dentists work with a special lamp or fitting rigged up near the chair to give a good light inside the patient's mouth; the rest of the surgery is more often than not lit to a very poor standard. The aim of the work done in France has been to improve lighting generally in the surgery and to ease the strain on the dentist. Two examples of re-lit surgeries are shown. Also shown are an operating theatre and a preparation room in a hospital in Hamburg where the general lighting fittings are recessed flush with the walls.

SPORTS

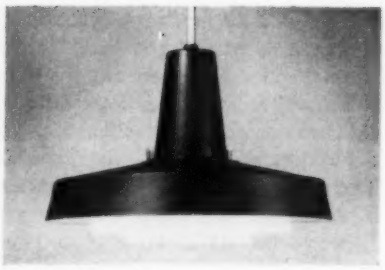
Lighting for sports, both indoor and outdoor, is a growing field of activity for lighting engineers. We have already mentioned floodlighting for golf, something undreamed of until recently, and floodlit football is now common throughout the world. The installation at the ground of Real Madrid was mentioned in a previous Review; last year similar high-power installations were put in for the Barcelona and Valencia football clubs. Also from Spain comes a very attractive picture of the municipal swimming bath at Madrid. Both Denmark and New Zealand report the growing popularity of floodlighting for training in football and athletics.

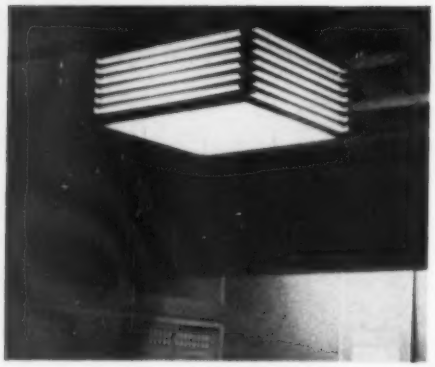
SHOPS AND SHOWROOMS

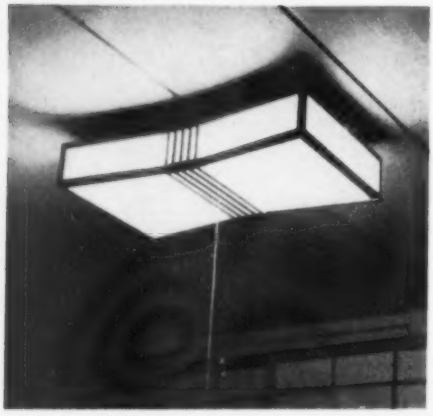
The last main section of the Review deals with shops and showrooms where lighting is more an art than a science. No new technique, other than the use of low-voltage spots, seems to have emerged during the past year, but this again is probably a field in which there is now such a vast range of lamps and equipment that the lighting engineer (provided he has the experience and the all-important 'know-how') can provide whatever the customer or architect requires. In the supermarket—a term now generally applied to any large self-service shop—the requirement is plenty of light and illumination levels of up to 300 lm/ft^2 are quoted. Though there may be less 'art' in the lighting of supermarkets than there is in the lighting of speciality shops the former is nevertheless very important in creating an atmosphere of super-efficiency, in helping shoppers to recognize the goods they want, and in accelerating movement through the shop.

So we come to the end of our sixth International Review. We have learned a lot in its preparation and hope that you will find much of interest in the pages which follow. A review such as this reminds us of the important contribution the lighting engineer makes to the life of the community. During recent years the lighting engineer has had to tackle many new problems and to extend his field of activity; the indications are that with the increasing rate of progress in science and industry, with the rapid development of resources and the greater amount of leisure which it would seem is to be at our disposal, the demands on the lighting engineer will increase. Whether he will be able to meet these demands will, we would suggest, depend to a large extent on his ability to master the artistic side of lighting as well as the engineering side. Fortunately there are leaders in the lighting field who are aware of the growing responsibility of the lighting engineer for the 'visual field' and are seeking ways to give reasonable assurance that lighting installations of the future will be aesthetically satisfying as well as technically efficient.

In conclusion we have to thank the contributors from many countries who gathered together information on lighting developments in their respective countries—a task they have once again performed with the impartiality that is typical of the lighting industry we serve.





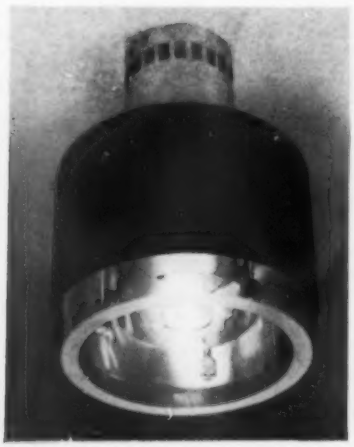


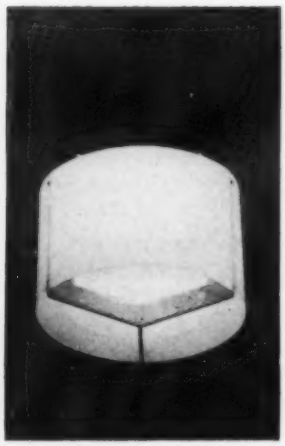
Above, three tungsten lamp luminaires from Denmark. From left to right: ceiling fitting for three lamps, white painted with etched pattern; fitting with opal plastic diffuser and nylon louvres for 200-watt tungsten lamp or 32-watt circular fluorescent lamp plus 40-watt tungsten; pendant fitting with spun metal shade designed by Ole Hagen to house half-silvered lamp. (Lyfa, Copenhagen.)

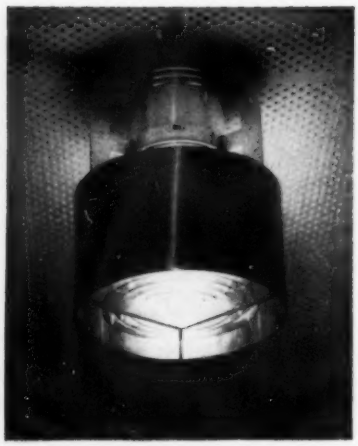
Left, two Japanese fluorescent home lighting luminaires with timber frames and acrylic plastic diffusers. The top fitting uses a circular lamp. (Matsushita, Osaka.)

Right, adjustable spotlight for use with standard or low-voltage half-silvered lamp (Philips, Copenhagen) and mine-lighting fitting using HT circular fluorescent lamp. (Schneider, Frankfurt.)

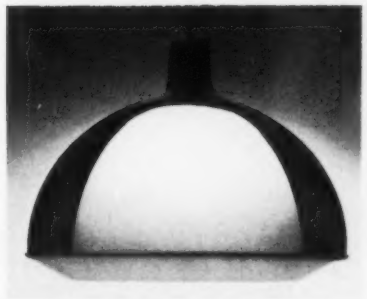
Below, three ceiling mounting fittings from Denmark. From left to right, louvred fitting with inner shade of Orrefors glass and lamp positioned to give edge-lit rim (Lyfa, Copenhagen), and two fittings designed by the architects Gunloegsson and Joern Nielsen for Kastrup Town Hall. (Louis Poulsen, Copenhagen.)



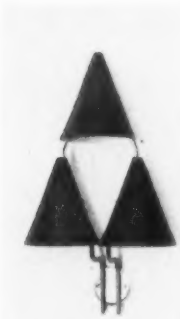


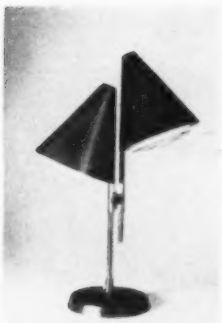


LUMINAIRES

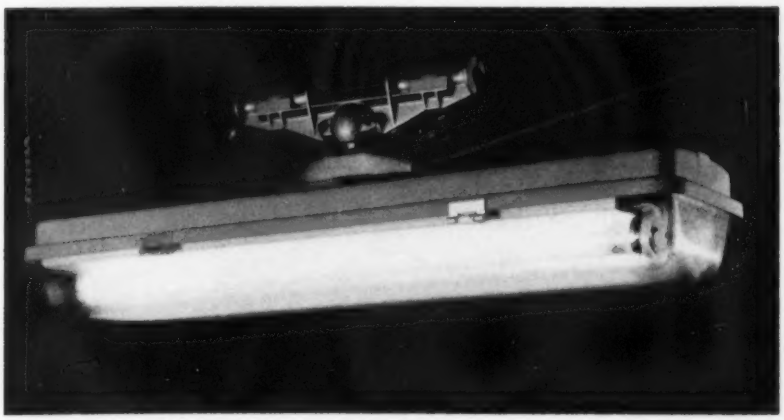


Right, from Finland: adjustable recessed spot-light with 'eyeball' of opal glass; pendant fitting with two 'Perspex' shades, the outer one coloured; table lamp with cylindrical base of clear 'Perspex'; and floor standard for outdoor use with Rotoflex shade. (Orno, Helsinki.)





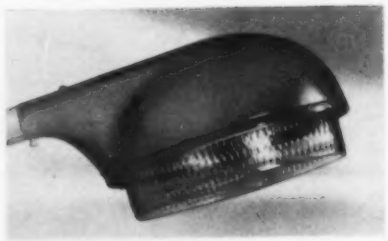
Left, wall bracket and table lamp from range of fittings designed by architect Bent Karlby. Spun metal shades are fitted with nylon louvres and the range includes a rise-and-fall pendant. (Lyfa, Copenhagen.)



STREET LIGHTING

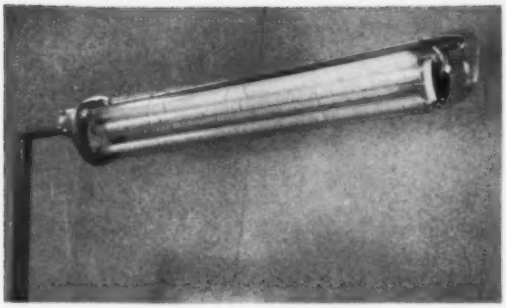
Street lighting lantern for a 65-watt U-shaped fluorescent lamp. The body of the lantern is made of a polyester resin reinforced with glass fibre. (Siemens-Schuckert, Erlangen.)

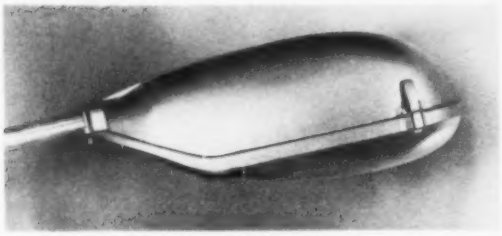
Right, installation at Skive, Jutland, of lanterns housing two 65-watt fluorescent lamps. (Nordisk Elektricitets Selskab, Copenhagen.)

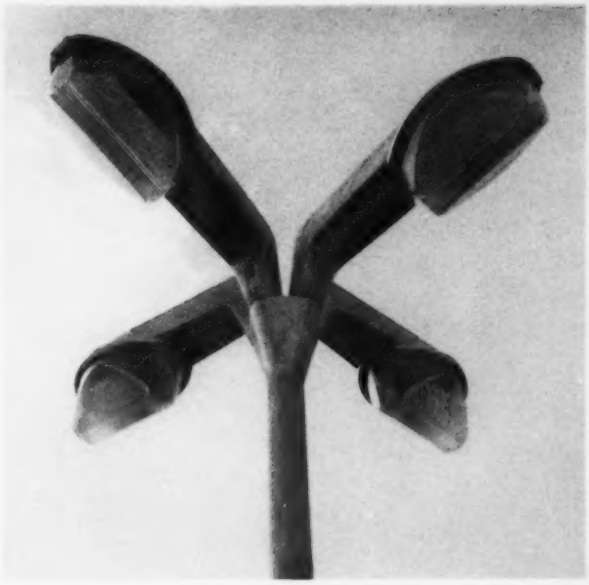


STREET LIGHTING (continued)

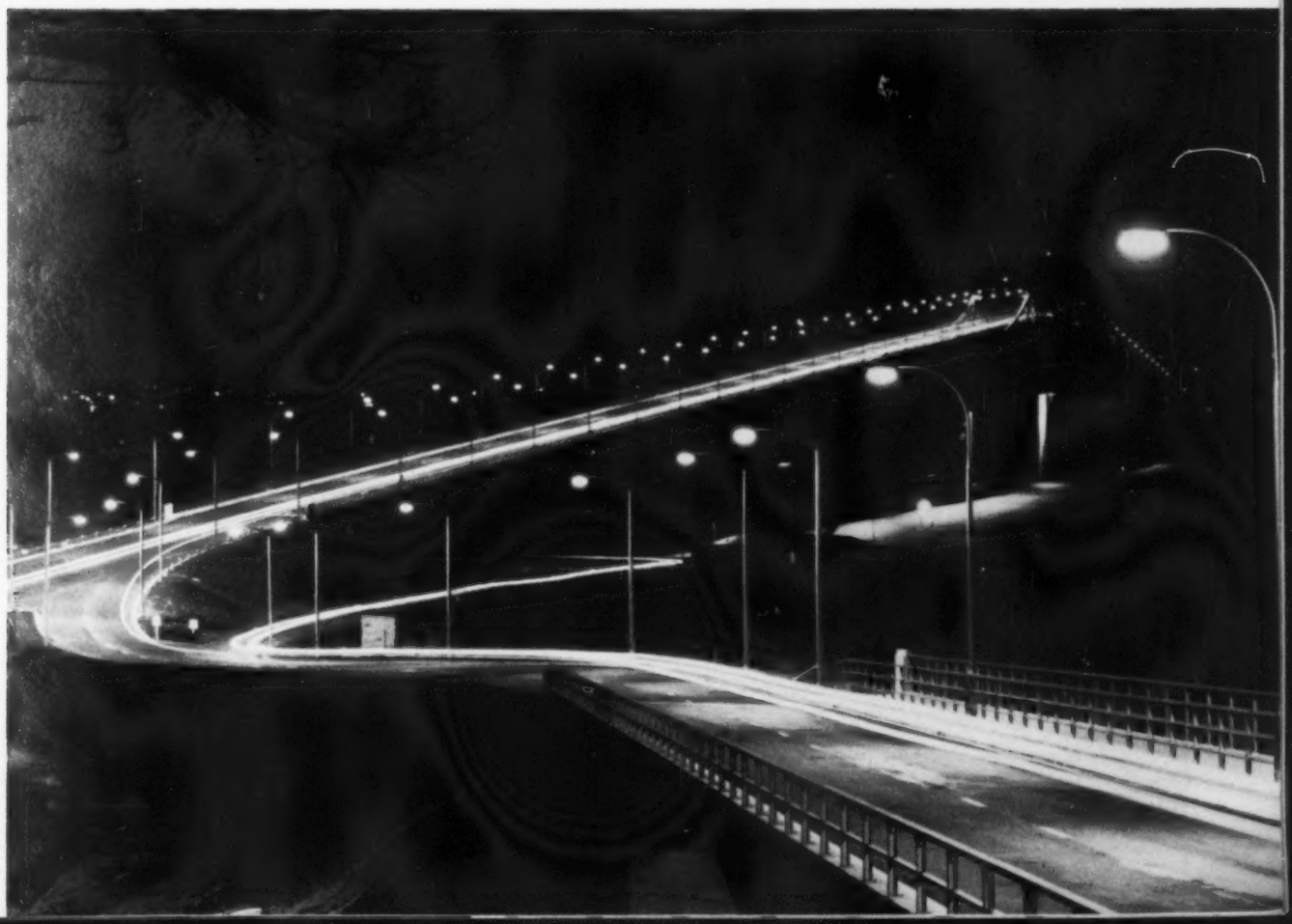
Left, six lanterns from Germany. Top to bottom: (1) post-top lantern for one 250-watt mercury lamp containing reflectors which are adjustable according to spacing-height ratio (Schanzenbach, Frankfurt); (2) wall-mounting lantern for 250-watt mercury lamp (Zeiss-Ikon, Berlin); (3) lantern for use with either mercury or sodium lamps giving wide angle distribution (Schneider, Frankfurt); (4) post-top lantern for one 250-watt mercury lamp or two 60-watt sodium lamps (Schanzenbach, Frankfurt); (5) 250-watt mercury lamp lantern (Zeiss-Ikon, Berlin); (6) mercury lamp lantern of aluminium alloy designed for use with a concrete column of concave-triangular cross section (see p. 95). (Hellux, Hanover.)







Above left, totally enclosed lantern for three 40-watt fluorescent tubes and lantern for one 125- or 250-watt colour-corrected mercury lamp. (Schreder, Ans-Lez-Liege.) Above right, cruciform arrangement of lanterns for 250-watt colour-corrected mercury lamps. (Siemens-Schuckert, Erlangen.) Below, sodium lighting on the approaches to the Auckland Harbour Bridge. Cut-off lanterns housing 140-watt lamps are used on the bridge and 85-watt cut-off lanterns on the approaches.



STREET LIGHTING (continued)

Above, the Pont de Tancarville near le Havre lit by 125-watt colour-corrected fluorescent lamps on 8-metre columns. (Claude, Paz et Visseaux, Paris.) Below (1) Viale di Pavia lit by fluorescent lamp lanterns on 'whip-shaped' concrete columns (Edisonvolta, Milan); (2) lighting of a fly-over at Ludwigshafen by slim lanterns housing four 65-watt fluorescent tubes at a height of 9·5 metres (AEG, Hameln); (3) the new lighting on the Paseo de la Castellana in Madrid using 400-watt colour-corrected mercury lamps mounted at 12 metres at a spacing on each side of the road approximately 20 metres.

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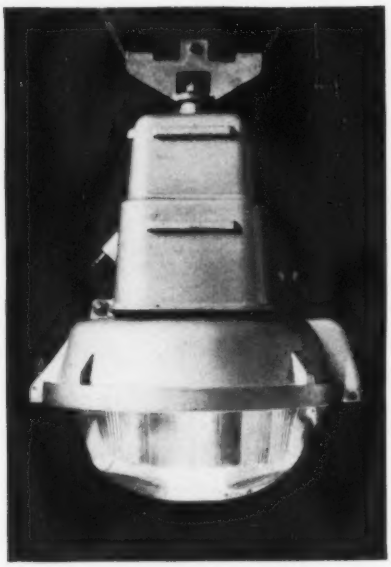
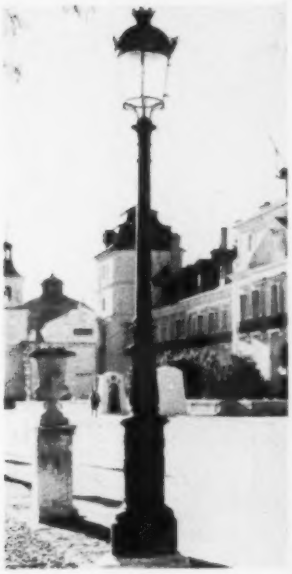


Above, lantern for 250- or 400-watt mercury lamp with built-in control gear. (Tez, Zagreb.)
Below, the Frankfurt intersection on the Cologne autobahn lit by 132 lanterns each housing two colour-corrected mercury lamps on 'whip-shaped' tubular steel columns at a mounting height of 10 metres and a spacing of 25-30 metres. (Philips, Hamburg.)

Below from left to right: one of the old lamp-posts outside the El Pardo Palace in Madrid which has been restored and converted to use electric lamps; a concrete column on which are mounted a pair of the lanterns shown at the foot of page 92 (Hellux, Hanover); and one of the post-top fluorescent lanterns which are now replacing gas lanterns in Copenhagen. (Philips.)

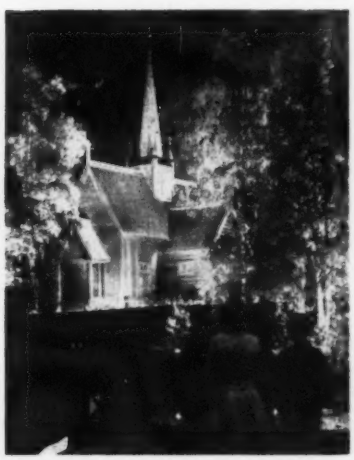


Top, view of the Acropolis, Athens, as seen by the audience at the sound and light spectacle; left and above, two views of the Parthenon and adjacent ruins. (Philips.)

Floodlighting of the S. Giulio island on Lake Orta, Italy, by a mixture of filament and mercury lamps. (Dinamo, Milan.)

Two floodlit chateaux in Belgium; right, Le Roeulx and, below, the chateau Fontaine l'Eveque. (ACEC, Charleroi.)

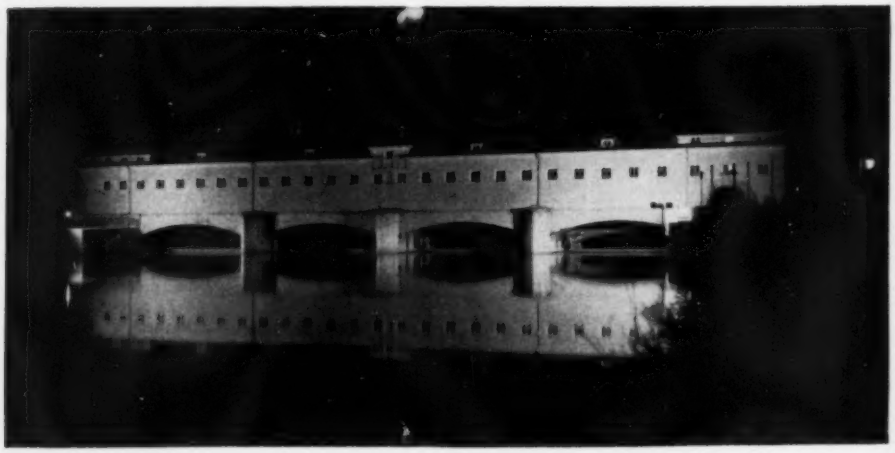
FLOODLIGHTING

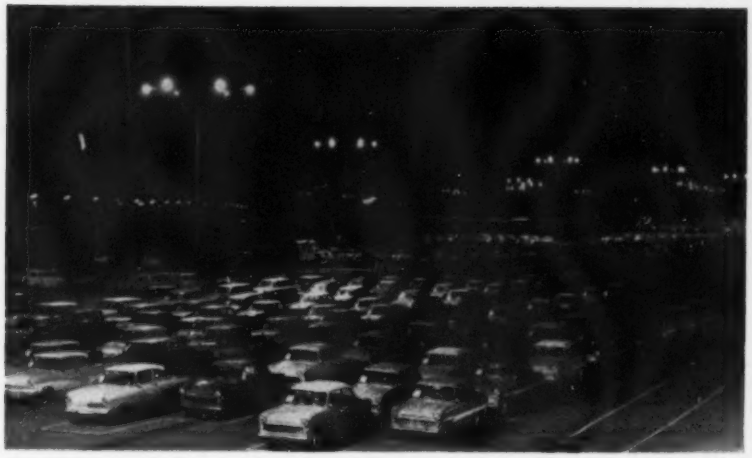


Extreme left, part of the lighting for a sound and light spectacle in Geneva—the monument International de la Reformation. (Compagnie des Lampes.) Left, floodlighting of Garmo church, Lillehammer, Norway.

Above, Church of Ste Ana in Barcelona lit by one 3 kW projector. Left, Chiaravalle Abbey, the steeple of which is lit by projectors on the roof; 27 colour-corrected mercury lamps and four tungsten lamps are used. (Edisonvolta, Milan.) Below left, west front of cathedral at Murcia. Below, sodium lighting at a weir from projectors on the banks of the stream. (Philips, Hamburg.)

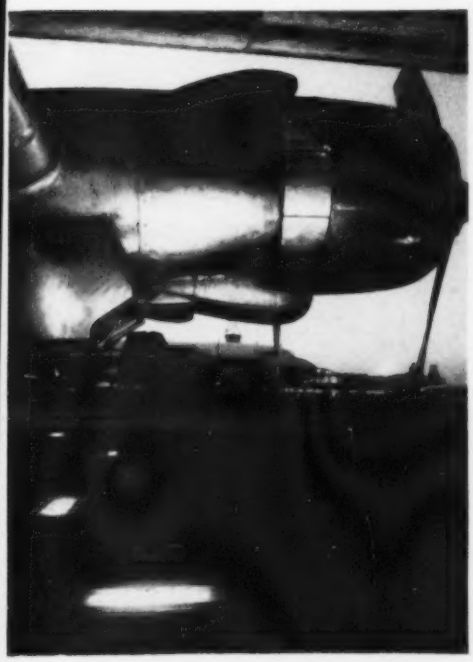
FLOODLIGHTING (continued)

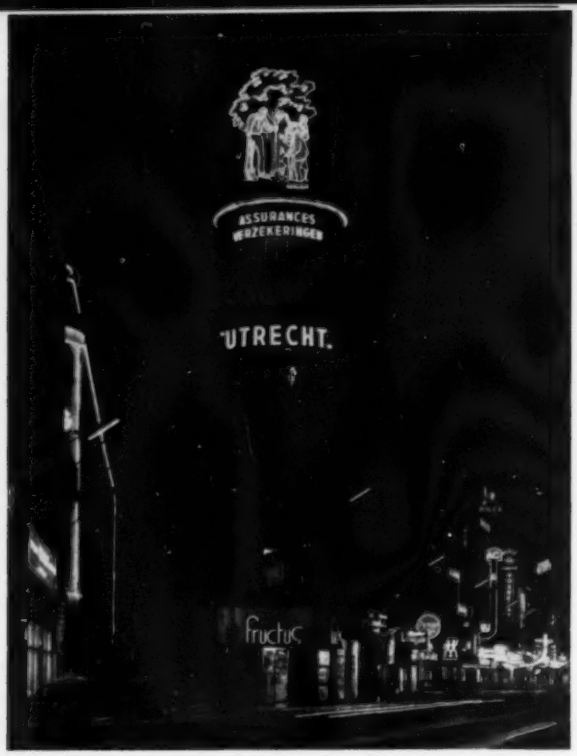




OTHER EXTERIORS

Above left, parking ground for cars awaiting shipment at the Ford Motor Company plant at Cologne lit by 250-watt colour-corrected mercury lamp fittings mounted in groups of six on 12·5 metre columns. (Siemens-Schuckert, Erlangen.) Above right, the statue of Minerva at Parvia lit by four filament lamp projectors. (Edisonvolta, Milan.) Below, flush fittings on the aircraft servicing area at Copenhagen airport. (Lyfa, Copenhagen.) Right, a switchyard lit by fluorescent lamp luminaires with acrylic covers above and below to give upward and downward lighting; the fittings are mounted on telescopic poles so that they can be lowered for maintenance. (Siemens-Schuckert, Erlangen.)





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(1) The facade of Le Paris cinema on the Champs Elysees in Paris lit by spot lamps and cold cathode tubing. (Claude, Paz et Visseaux, Paris.) (2) Cold cathode signs in Brussels. (Neolight.) (3) A fitting for lighting flower beds designed by Simon Henningsen for the Tivoli Gardens. (Lyfa, Copenhagen.) (4) Lighting of a table on the terrace of a restaurant by an indirect fitting on the stem of the parasol. (Compagnie des Lampes, Paris.) (5) Garden lighting by means of 150-watt PAR lamps in a simple waterproof lampholder. (Philips, Copenhagen.)

Above and right, two views of a Japanese garden near Boulogne lit by 150-watt PAR lamps carefully concealed amongst the foliage and plants. (Compagnie des Lampes, Paris.)

Left, the central market at Nuremberg lit from 54 tubular steel columns each supporting four lanterns housing three 65-watt fluorescent tubes. The average illumination is 3 lm/ft². (Siemens-Schuckert, Erlangen.)

Above, a dry dock at Roosenburg, Holland, lit by 250-watt mercury lamps. (Philips, Holland.) Left, high intensity warning beacons on the new television mast at Dortmund; three short-arc 2kW xenon lamps are used together with a rotating optical system to give two beams from each lamp. (Siemens-Schuckert, Erlangen.)

OTHER EXTERIORS (continued)

Right, the station square at Kyota, Japan, lit by 400-watt colour-corrected mercury lamps mounted on 17 metre columns.

INDUSTRY

(1) The control room at Aalborg power station in Denmark. Fluorescent lamps are recessed into the ceiling and covered by 'Fotalite' glass which incorporates louvres to reduce glare; the louvres in the rows of light nearest to the control panels are inclined towards the panels to provide a high vertical illumination. (Lyfa, Copenhagen.)

(2) The tool shop of a rubber factory in Munich lit by fluorescent fittings above the crane and by local filament fittings on the machines. (Siemens-Schuckert, Erlangen.)

(3) Vapour-proof fluorescent fittings in a spray-booth. (Compagnie des Lampes, Paris.)

(4) and (5) Lighting in a hydro-electric power station by means of cornice-type fluorescent fittings mounted below the crane rails, and a power station control room lit by a luminous ceiling. (Siemens-Schuckert, Erlangen.)

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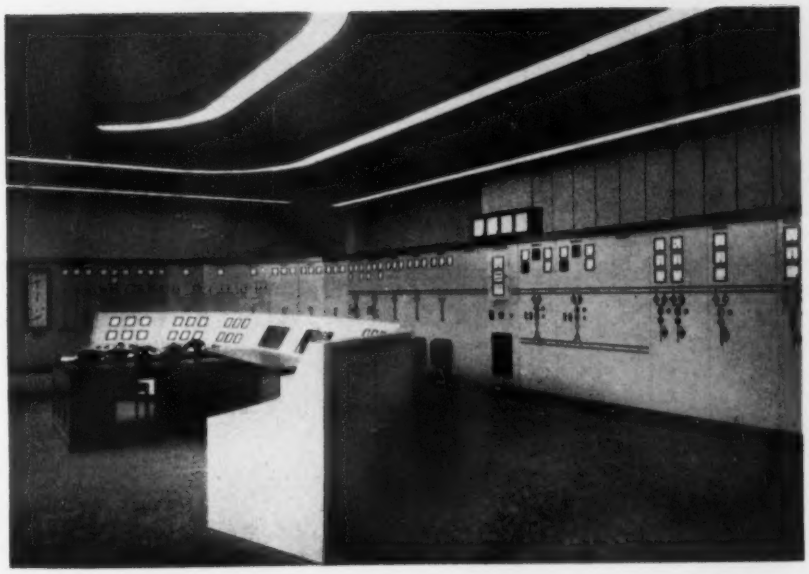
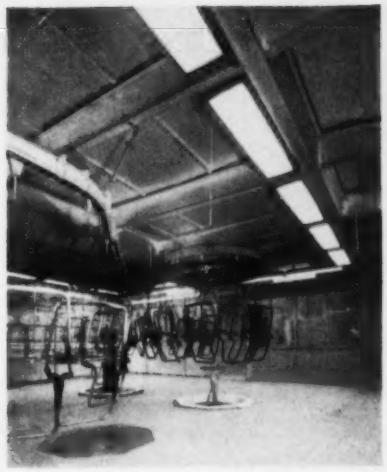
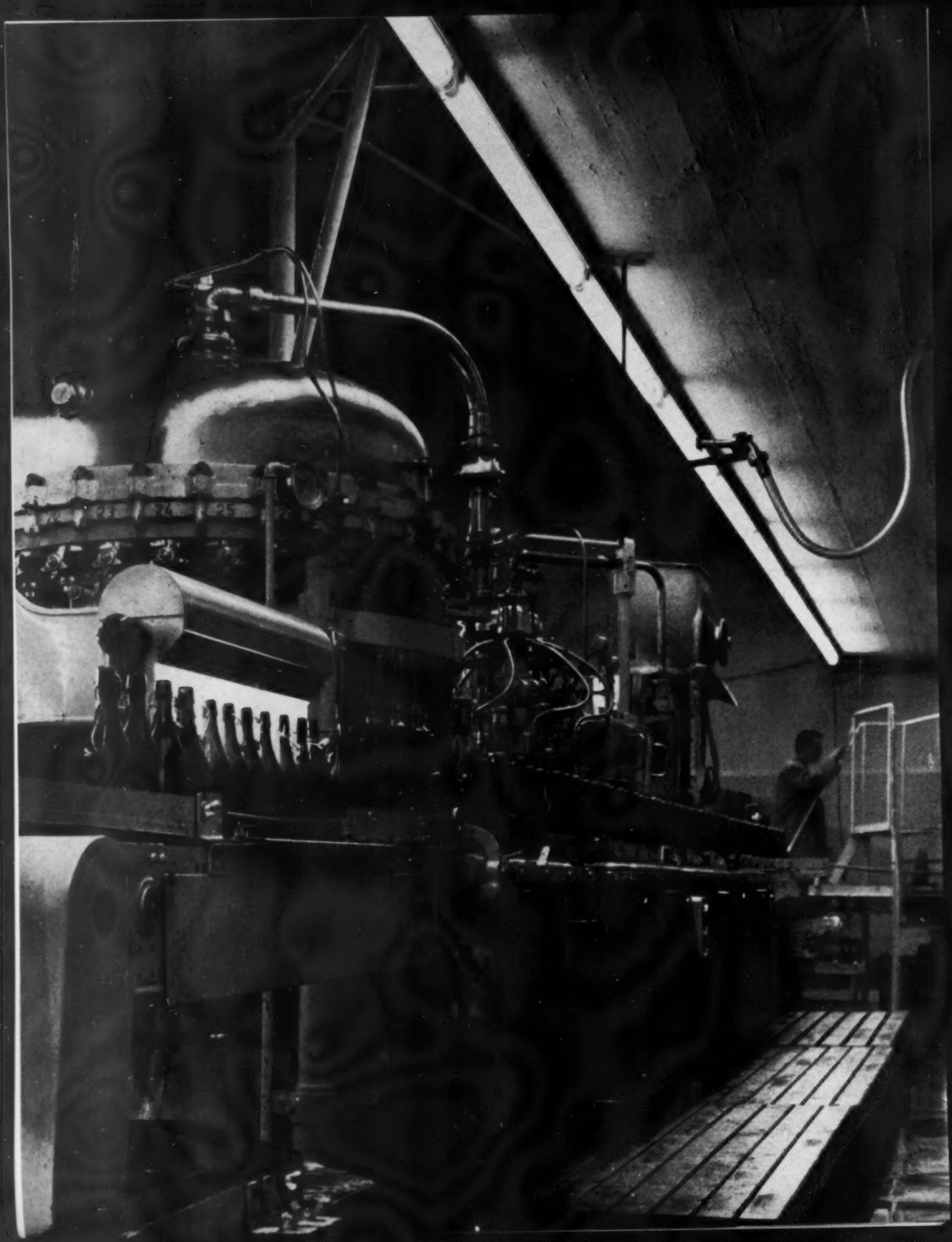
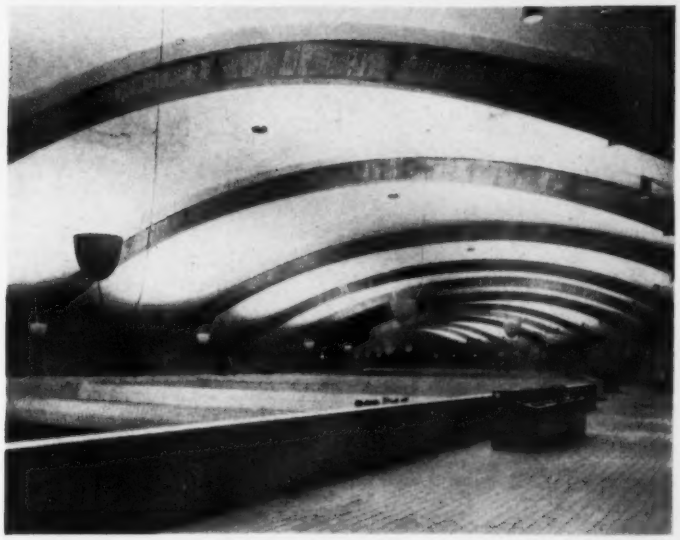


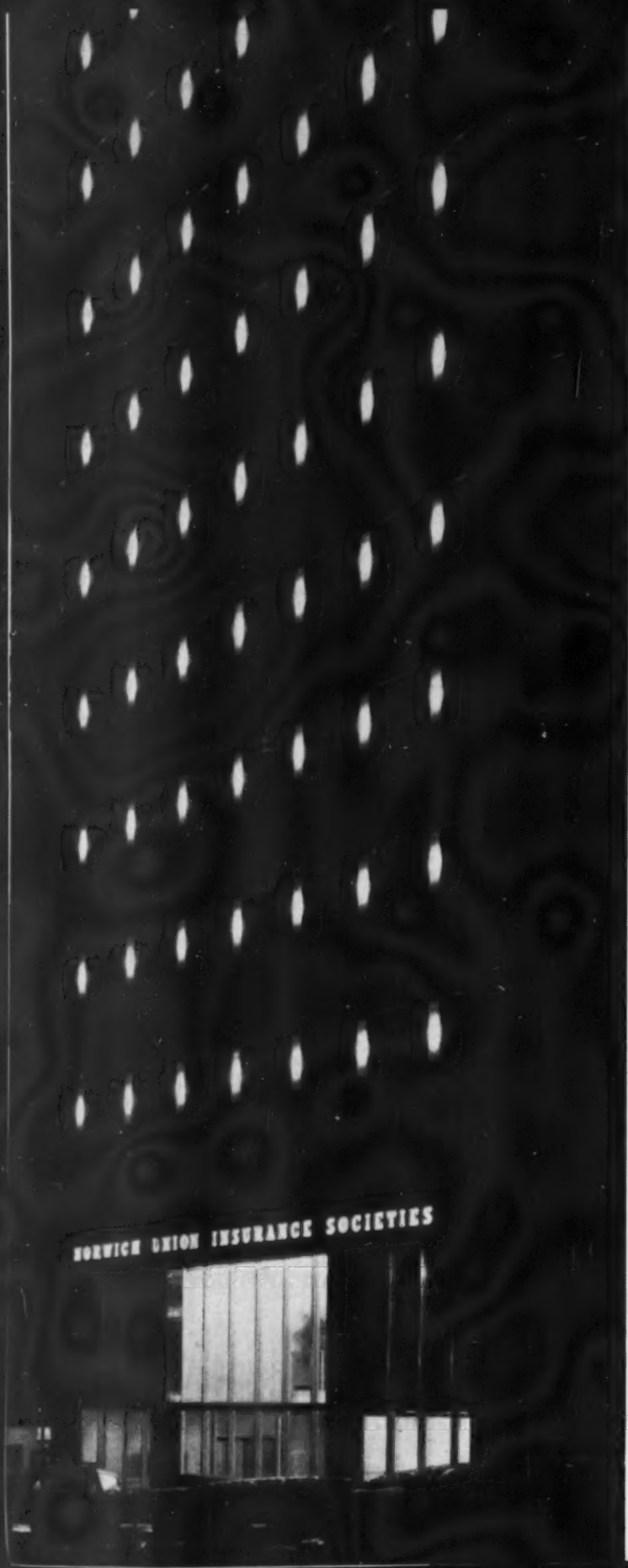


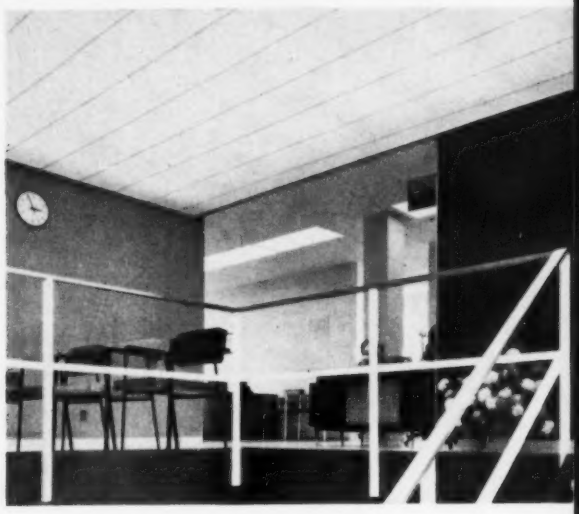


INDUSTRIAL (continued)



Facing page, bottle filling and inspection plant at the 'Pschorrbräu' brewery, Munich. The ceiling fittings are fully enclosed and made of polyester resin reinforced with glass fibre. Note silhouette inspection unit on left. (Siemens-Schuckert, Erlangen.) Above, turbine hall of the Rheinau hydro-electric plant lit by cold cathode tubing following the profile of the Portal frames. (Rovo, Zurich.) Right: top, precision tool workshop with general lighting from staggered rows of fluorescent fittings mounted on the uninterrupted surface of the false ceiling and heavily shielded to avoid glare (AEG, Frankfurt); centre, indirect lighting reflected from shell-concrete roof at a water filtration plant, each fitting housing a 700-watt colour-corrected mercury lamp (AEG, Frankfurt); bottom, spinning mill in Alost, Belgium, lit by continuous rows of surface mounted fluorescent batten fittings. (Philips, Belgium.)





Left, the facade of the Norwich Union Insurance Company building, Melbourne (architects, Yuncken, Freeman Brothers, Griffiths and Simpson). Rectangular panels of white enamelled steel are lit by 75-watt tungsten lamps shielded by translucent plastic covers. (Electricity Trust of South Australia.) Top, punch-card section of a savings bank with indirect lighting from trough reflectors. (Philips, Hamburg.) Above, luminous ceiling giving 100 lm/ft² in the lobby of the head offices of a large chain of drug stores in Canada.

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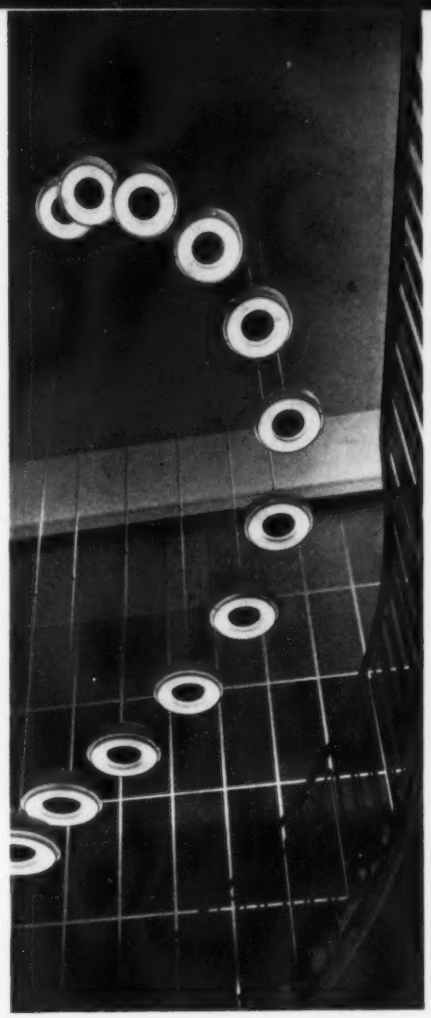
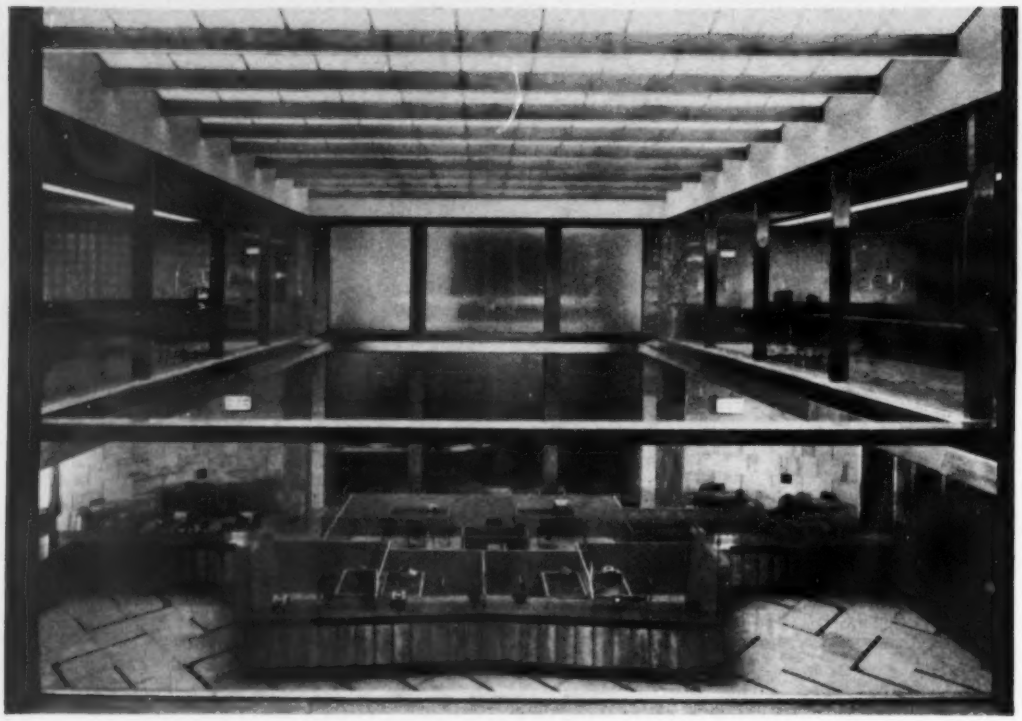


(1) Staircase at the head office of the Ford Motor Company, Copenhagen, lit by a spiral of suspended fittings each housing a 32-watt circular fluorescent lamp and a 40-watt tungsten lamp and fitted with louvres. (Philips, Copenhagen.) (2) Luminous ceiling in Continental National Bank, Omaha, Nebraska, with opaque canopy over central area. (Wakefield, Vermilion.) (3) Luminous ceiling in the Citizens' Federal Savings and Loan Association, Bay Village, Ohio, with raised central area into which rectangular luminaires are recessed. (Wakefield, Vermilion.) (4) Information desk at SAS air terminal, Copenhagen, lit indirectly by special fittings designed by architect Arne Jacobsen. (Louis Poulsen, Copenhagen.) (5) Offices of the McDowell Company in Cleveland, Ohio, using the latest version of the Wakefield 'Sigma' luminous and acoustic ceiling.

OFFICES AND BANKS



Main hall of the Banca Provinciale Lombarda, Milan, lit by luminous ceiling with deep hollow transverse baffles themselves housing rows of fluorescent lamps. (CEIET, Milan.)

OFFICES AND BANKS (continued)

Right, the new Sumitomo Bank in Tokyo. (1) Coffered ceiling of the main banking hall lit by fluorescent lamps behind 'Honey-Lite' fine aperture aluminium louvres. (2) Ground floor lift lobby with fluorescent lamps concealed by deep metal louvres. (3) Lift lobby of an upper floor lit by recessed luminous beams. (Matsushita, Osaka.)

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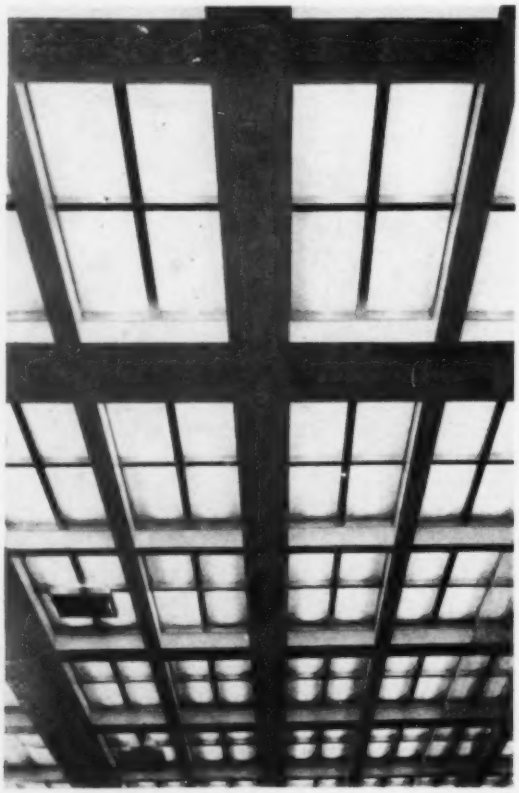
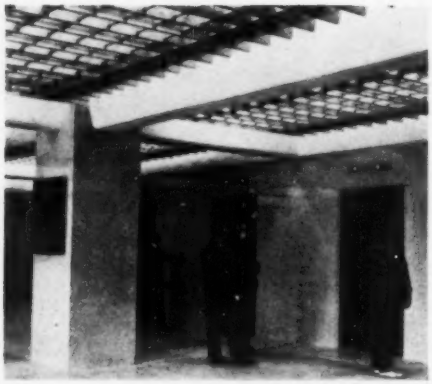
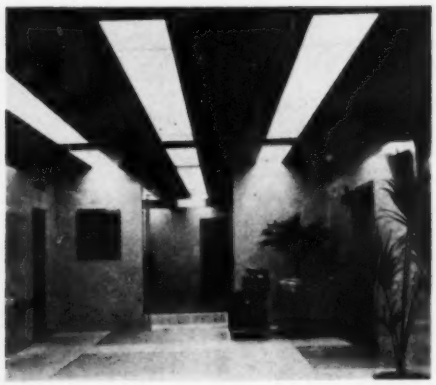
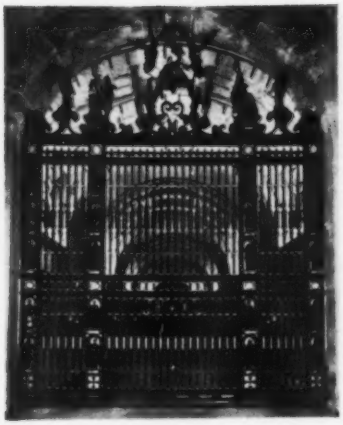


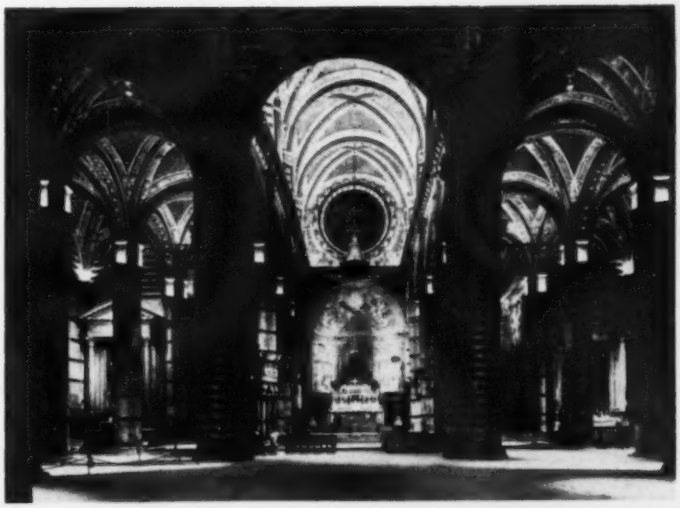




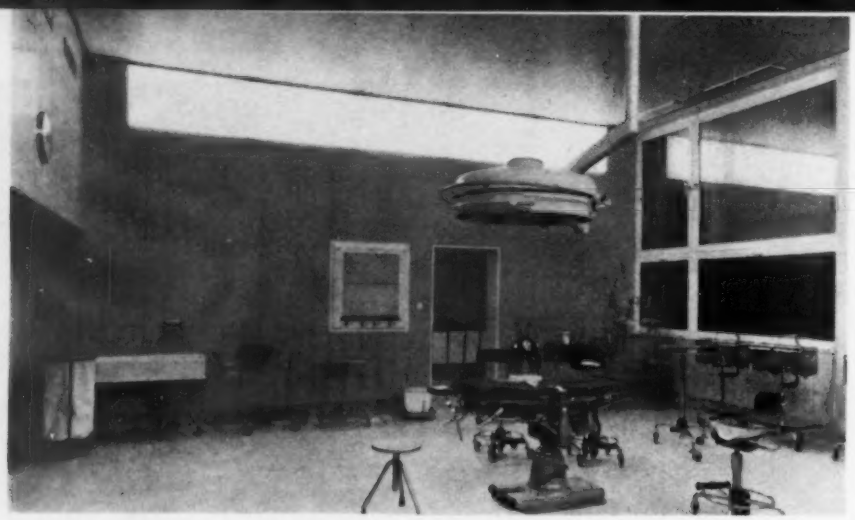


Memorial Cathedral built into the hillside outside Madrid. Right, the vast barrel-vaulted nave with indirect lighting from cornice and decorative lighting from wall mounted flambeaux. Above, close-up of wrought-iron screen.

CHURCHES



Above, church of St Louis de Brest lit by twelve rows of 150-watt projector lamps recessed into the 21-metre high flat ceiling (Compagnie des Lampes, Paris.) Right, new lighting scheme at the Cathedral of Sienna, one of the loveliest cathedrals in Northern Italy. Top, view of east-end seen from the crossing; bottom, the Piccolomini Gallery with local lighting for manuscript collection. (Buini and Grandi, Bologna.)



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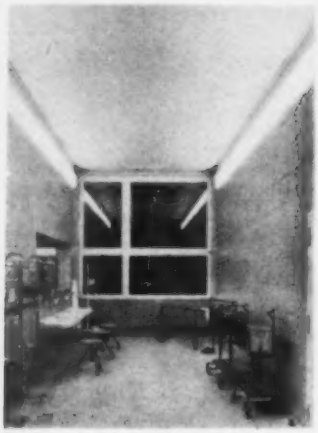
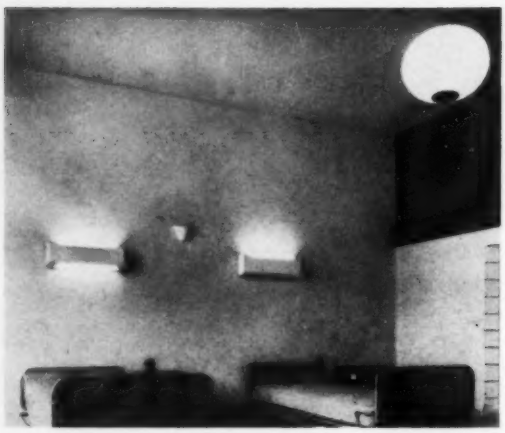
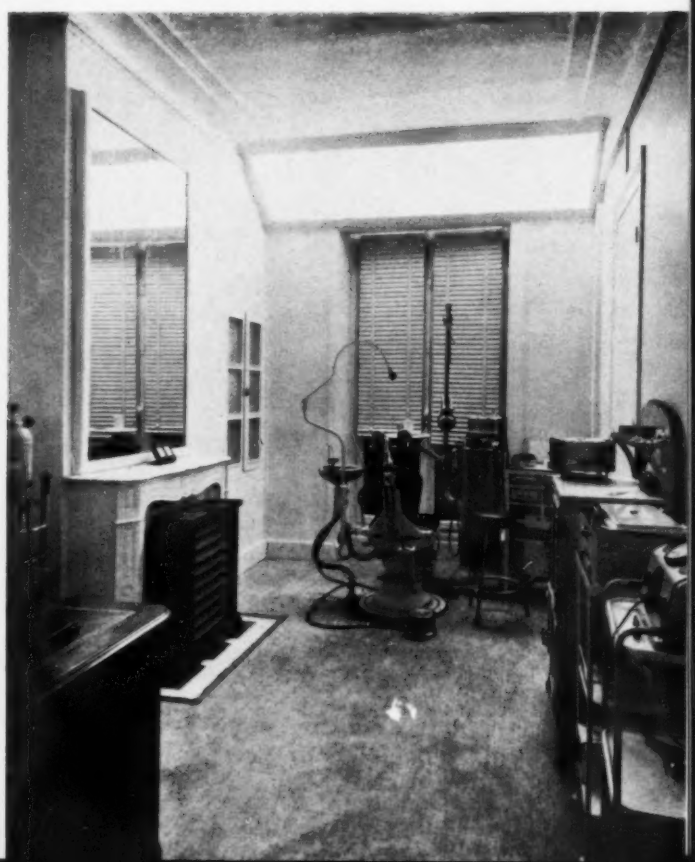


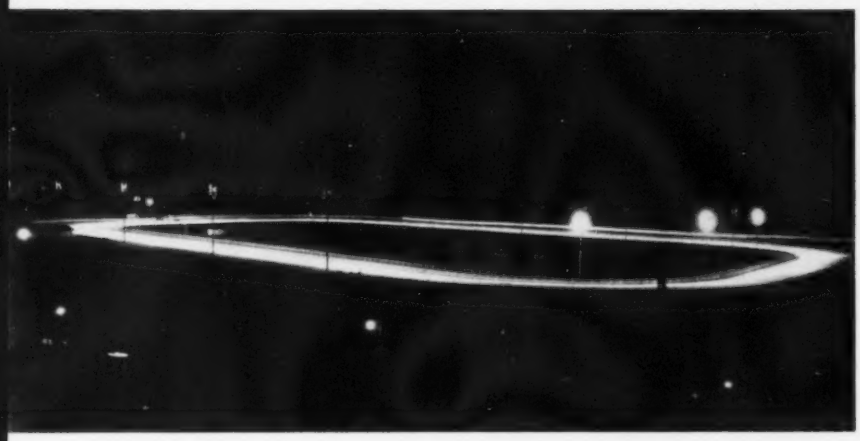


(1) Operating theatre in a Hamburg hospital lit from two sides by fluorescent lamps recessed into the walls and covered by flush fitted acrylic panels. General illumination is 80 lm/ft². (2) Medical preparation room in the same hospital using similar lighting arrangement. (Kaiser, Neheim.) (3) Fluorescent bed lighting fittings in ward at Holstebro hospital, Denmark. Each fitting houses two 20-watt lamps, one for reading, the other for upward lighting. (Lyfa, Copenhagen.)

MEDICAL AND DENTAL

Two dental surgeries in France; one, right, lit by means of fluorescent lamps behind an inclined 'Perspex' panel; and the other, below, lit by a circular fluorescent ceiling fitting to give light on the patient, and by indirect lighting along one wall and by a window of glass blocks in front of the chair. (Compagnie des Lampes, Paris.)





SPORTS

Above, the stadium of the Barcelona Football Club. Left, the track of the Auckland Trotting Club in New Zealand lit by 318 1,500-watt floodlights mounted in groups on 80-ft. steel poles; the illumination on the track varies between 20 and 27 lm/ft². (National Electrical, Wellington.) Below, municipal swimming pool in Madrid.

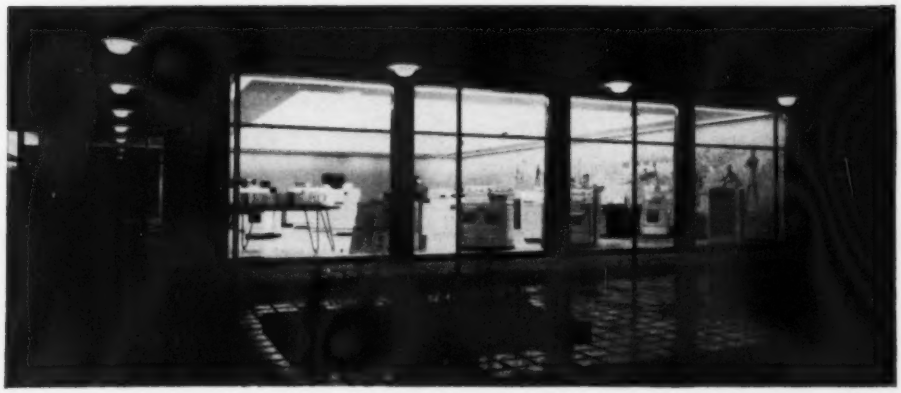
SPORTS (continued)

Above, sports centre of the Technological University, Delft, lit by recessed fluorescent fittings and filament spot lights. (Philips, Holland.) Right, artificial ice skating rink in Copenhagen lit by suspended cut-off street lighting fittings housing 750-watt filament lamps in anodized aluminium reflectors. (Lyfa, Copenhagen.)

SHOPS AND STORES

Left, glassware showroom in Brisbane, Australia, with display frames placed against luminous wall panels to silhouette the goods. Below, Kodak showroom in Adelaide with luminous ceiling comprising cold-cathode lamps concealed by plastic egg-crate louvre panels. (Electricity Trust of South Australia.)

Above, chemist's shop in Place St Ferdinand, Paris. The suspended canopy includes luminous panels and circular fittings for tungsten lamps, and gives 50 lm/ft². (Compagnie des Lampes, Paris.) Top right, horseshoe-shaped counter with sand-blasted glass top lit by pairs of 20-watt fluorescent lamps at 3-ft. centres, in glassware department of Brisbane store. Centre, right, cold cathode lighting on channels in the false ceiling of a shop in Zurich. The tubes are screened from view by large oval-shaped louvres. (Rovo, Zurich.)



Above, luminous wall of sand-blasted glass lit from behind by fluorescent lamps in the Farmers Union shop, Copenhagen. (Philips, Copenhagen.) Left, luminous ceiling of showroom of the Sydney County Council, Sutherland, NSW. This scheme was awarded one of the NSW Meritorious Lighting Awards for 1959.

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MISCELLANY

IES Meetings

LONDON
April 12
Office Lighting, by L. H. Hubble. The Federation of British Industries, 21 Tothill Street, SW1. 6.15 p.m. (Joint meeting with ASEE).

CENTRES AND GROUPS
April 6
EDINBURGH. Annual General Meeting. TMCA Social Room, 14 South St Andrew Street. 6.15 p.m.
NEWCASTLE UPON TYNE. Visit to Television Studios.
SWANSEA. Annual General Meeting. Demonstration Theatre, The South Wales Electricity Board, The Kingsway. 6.30 p.m.
April 7
CARDIFF. Church Lighting.
MANCHESTER. Annual General Meeting. Paper by P. Corry and A. Wilcock. Demonstration Theatre, Town Hall Extension. 6 p.m.
NOTTINGHAM. Trends in Lamp Design, 1884 to 1984, by E. E. Miles. Electricity Centre, Corrington Street, Nottingham. 6 p.m.
April 11
SHEFFIELD. Annual General Meeting. Industrial Lighting, by R. H. Sanders. Grand Hall. 6.30 p.m.

IES Summer Meeting

Registration forms for the IES Summer Meeting (Harrogate, May 15-18) have been sent to all IES members together with notes to initiate discussion at the group meetings on Tuesday, May 17. These notes make it even clearer that there is work for delegates to do at Harrogate. The subjects to be discussed (visual task analysis; luminance and glare; modelling and colour; industrial area floodlighting, with particular reference to railway sidings; maintenance of lighting installations; and lighting calculations) are all of immediate concern to the lighting engineer, and it is obvious from the notes that the IES Technical Committee and its Study Panels have already done a lot of work on them. (We cannot reproduce the notes here but any non-member of the IES who is interested can obtain copies—and a registration form—from the IES.)

In some of the notes definite questions are posed and others implied—and some answers will no doubt be found as a result of the discussions. Of perhaps greater importance, however, delegates will learn of current thoughts on these topics, will be able to cross-examine the 'experts' *and* will be able after the meeting to apply to their jobs knowledge that they cannot gather elsewhere. Add to all this the three forward-looking papers (on lamps, illumination levels, and plastics) and it is clear that the lighting industry has much to gain by sending delegates to Harrogate for what might now be called the 'lighting engineers' conference'.

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TECHNICAL REPRESENTATIVES. Leading manufacturers of modern lighting fittings, marketed principally through architects, have positions for young men with good education in the U.K. Sales Division. Lighting or Electrical knowledge would be an advantage. The work is interesting and varied and for six months candidates would be attached to internal sales departments obtaining a thorough knowledge of procedure. Commencing salary £700-£850. Positions are also open for SALES TRAINEES, commencing salary £450-£600. Please write to the Sales Director, The Merchant Adventurers Ltd., Hanworth Estate, Feltham, Middlesex.

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Postscript

I HAVE BEEN RE-READING a research report published thirty-one years ago on the relation of the adaptation of the eye to the critical frequency of flicker. The authors are Lythgoe and Tansley and the report was published for the Medical Research Council. The name of Lythgoe is probably best known in the lighting world for his classic work on the relation between illumination and visual acuity, although the results of this work were not published until 1932. Thirty years ago flicker was noticeable only in areas where the supply frequency was less than 50 cycles per second for, in those days, there were no fluorescent lamps and the electric lighting of interiors was generally by tungsten lamps. Moreover, levels of illumination were substantially lower than they are now, and the sensitivity of the eye to flicker is related to the general brightness of the environment. Although there is not at present any serious problem of flicker with modern fluorescent lighting, there is an obvious trend towards still higher levels of illumination and it may be that the present standard supply frequency will set a limit to this trend.

Particularly interesting in this respect is a warning given in the report referred to, because the authors were not anticipating the advent of general service lamps having phosphor instead of filament light emitters. This is how it reads: 'Before going on to describe our results on the effect of brightness of surrounds we would like to point out an important industrial implication of this effect of adaptation on the appreciation of flicker. As is generally known it is proposed to supply the whole of this country with electric light at a low rate of alternation. It is now obvious that if the light supplied is not to show an obvious flickering the intensity will have to be regulated in relation to the rate of alternation, since not only is the critical frequency value raised by the intensity of the light source itself, but the light adaptation consequent on a high intensity independently raises the value.' The reference to the 'low rate of alternation' is to the frequency of the national grid supply as we now have it. Was the choice of 50 cycles an error of judgment? And if illumination levels go much higher will frequency conversion become necessary for some installations?

MUCH HAS BEEN SAID AND WRITTEN about street lighting and accidents, but the sight of road users as a potential cause of road accidents has not been so often discussed. Good lighting makes for good seeing, of course, but it does not rectify defective vision. It may assist persons who have defective sight even more than it assists the normal sighted, but it does not remove their handicap altogether. Wearing corrective glasses may be necessary as well as good lighting and, even then, the eyesight of some people is not good enough for their own safety on the roads nor—if they drive vehicles—for the safety of other road users. According to the *British Medical Journal*, about 1,000 holders of current driving licences have had their sight tested in Sheffield and 7½ per cent of them could not read a number plate at twenty-five yards yet they did not wear glasses. Obtaining a driving licence is nominally conditional upon having at least the sub-normal standard of vision required to pass this test in daylight. Those who do not have this capacity may have still poorer vision outdoors at night, for even normal eyes tend to be somewhat short-sighted in dim light. Seventy per cent of the Sheffield drivers who failed to read a number plate at the specified distance had not realized that their distance vision was defective. More than half of them were past middle age and this is a time of life when insidious changes in vision may have proceeded far enough to make a check-up advisable. A small number of the Sheffield drivers—less than one per cent of the sample—had defective vision which could not be improved by glasses and they were advised to give up driving. Improving street lighting could not enable these persons to see as well as they ought to be able to see for safety in night driving. An investigation made by J. B. Davey a few years ago to ascertain the effect of visual acuity on driving ability showed that this ability is affected if the standard of vision is below that required to obtain a licence. Actually, however, there is much doubt whether ability to read a number plate at twenty-five yards is sufficient to indicate visual competence for driving, and I believe some stiffening of this test is contemplated. There are hazardous defects of vision which are not revealed by such a rough and ready test.

SOME TIME THIS YEAR COMPULSORY FITNESS tests for motor vehicles are likely to be introduced although, at first, only vehicles aged ten years or more will be involved. However, the number of such cars now registered is about two million, so the task of examining them will certainly be a big one. Naturally the lighting equipment of vehicles is to be examined and tested. There are existing regulations governing the positions of obligatory lamps and their colours, as well as the wattage of certain lamps, but the equipment—including batteries—must be in good order if the vehicle lighting is to be efficient. One of the most prevalent and disturbing faults at present is mis-aimed headlights, and this does not apply only to old cars. Although rear lamps are inadequately bright on many old vehicles, some of the latest models seem to have gone to the opposite extreme. What with brighter obligatory tail lamps, brighter stop lamps and bright flashing turning lights, stern-end glare is becoming menacing. This is a matter that may have to be dealt with eventually by new regulations. It is not obligatory for vehicles to have lighting equipment, nor for any such equipment to be in good order, except in lighting-up periods. But whether an old vehicle with defective lights can be given a pass certificate if the owner avows it will only be used in daylight is one of the points the Minister of Transport will have to decide before the tests are instituted.

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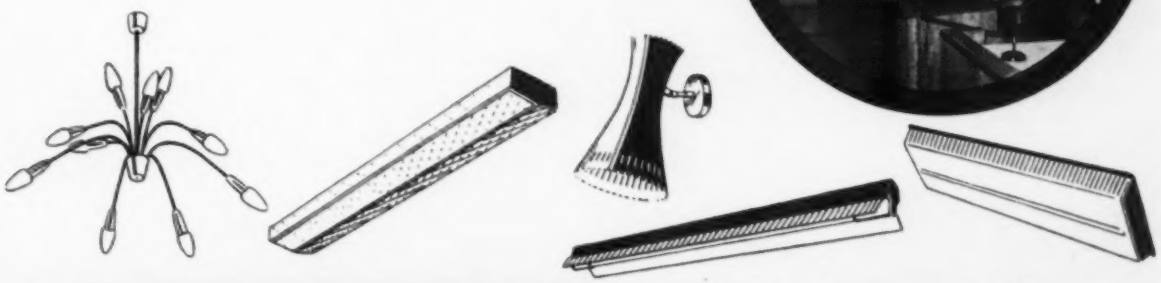

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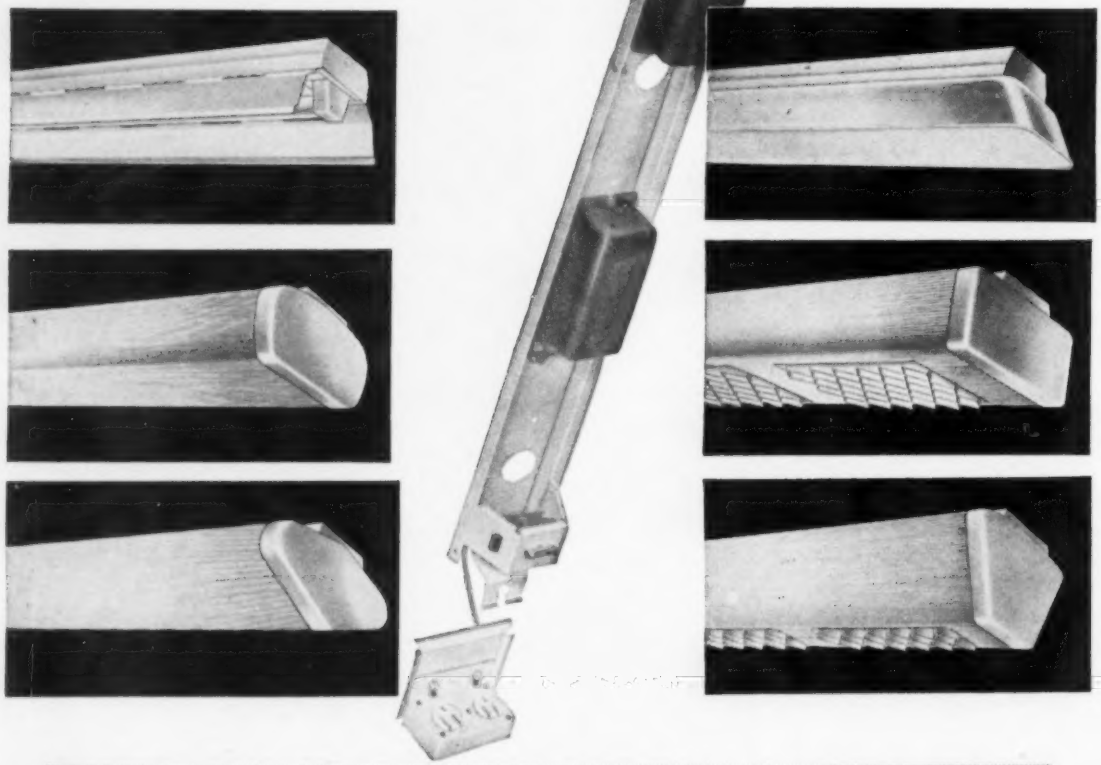

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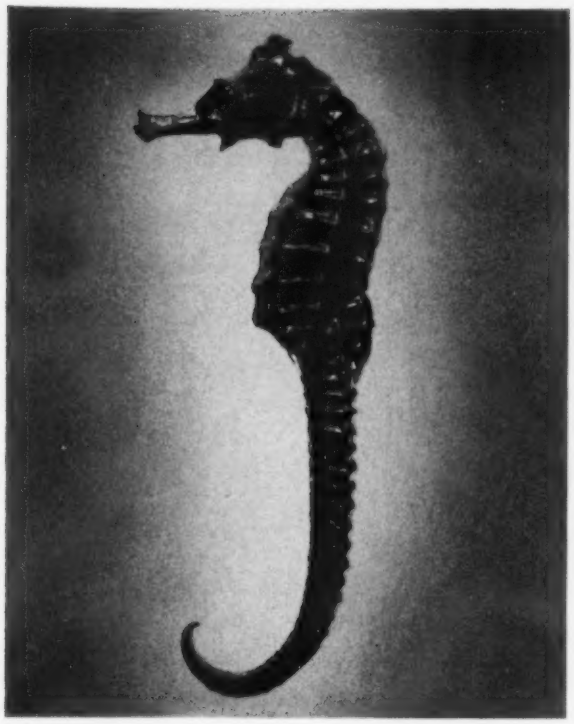

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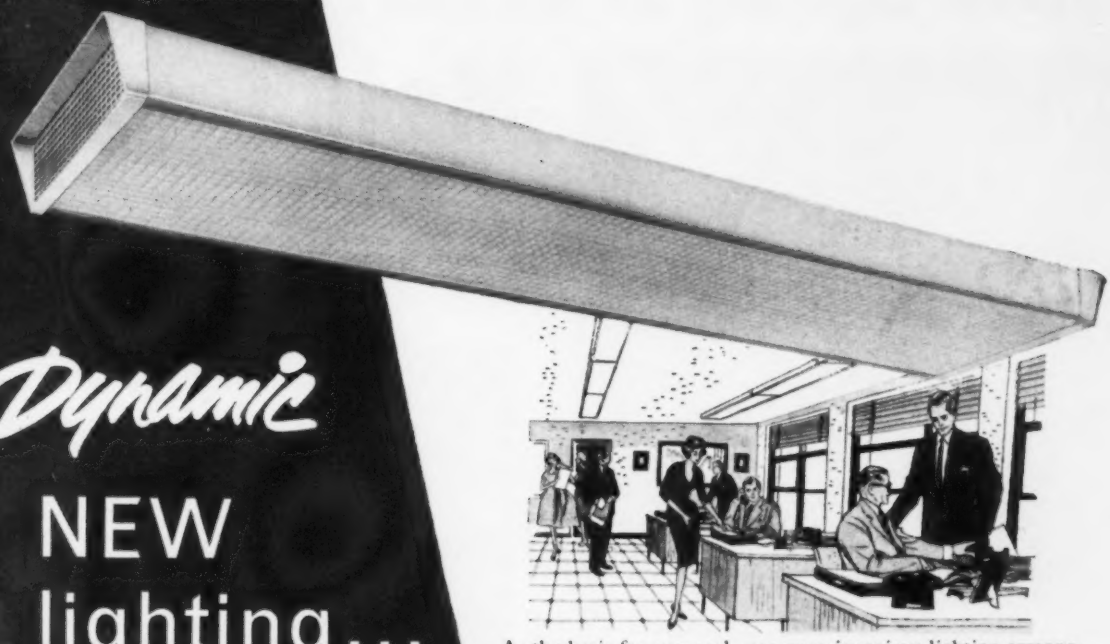

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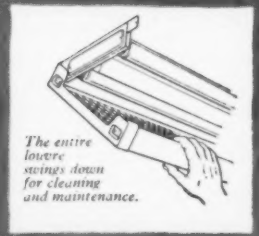

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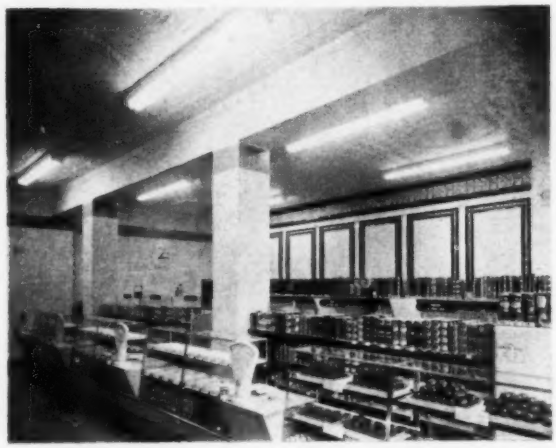

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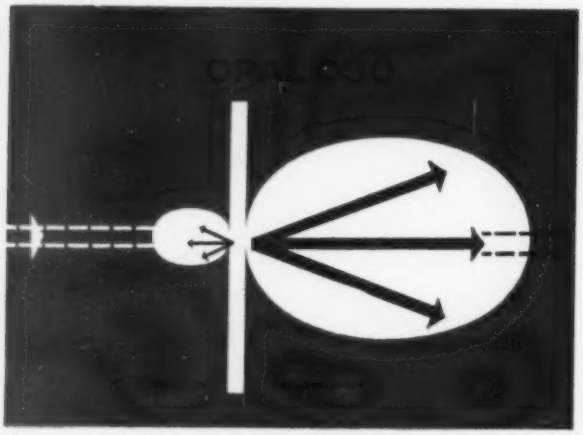

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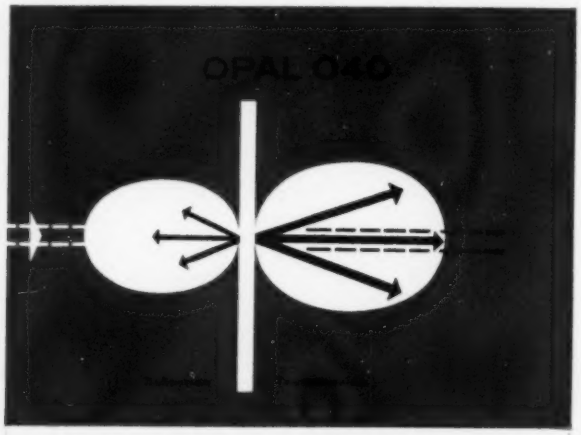

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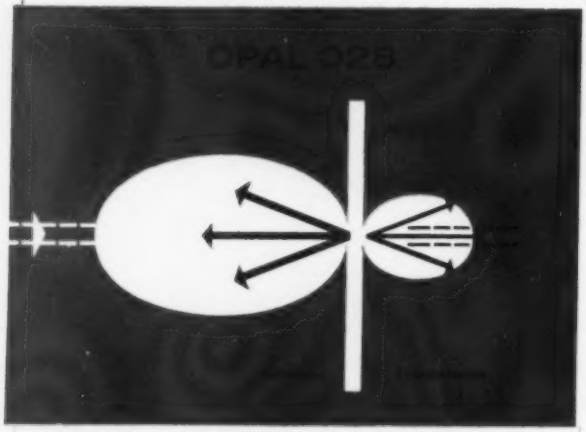

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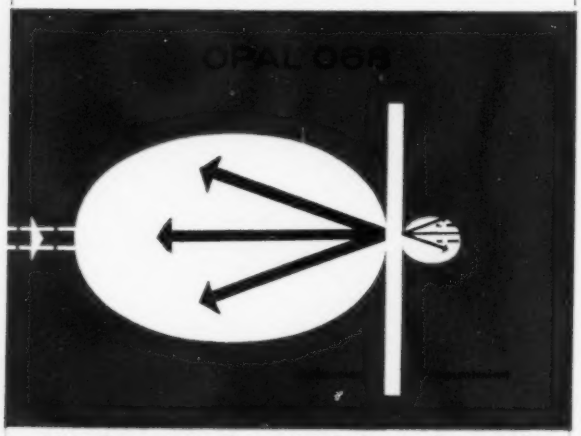

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